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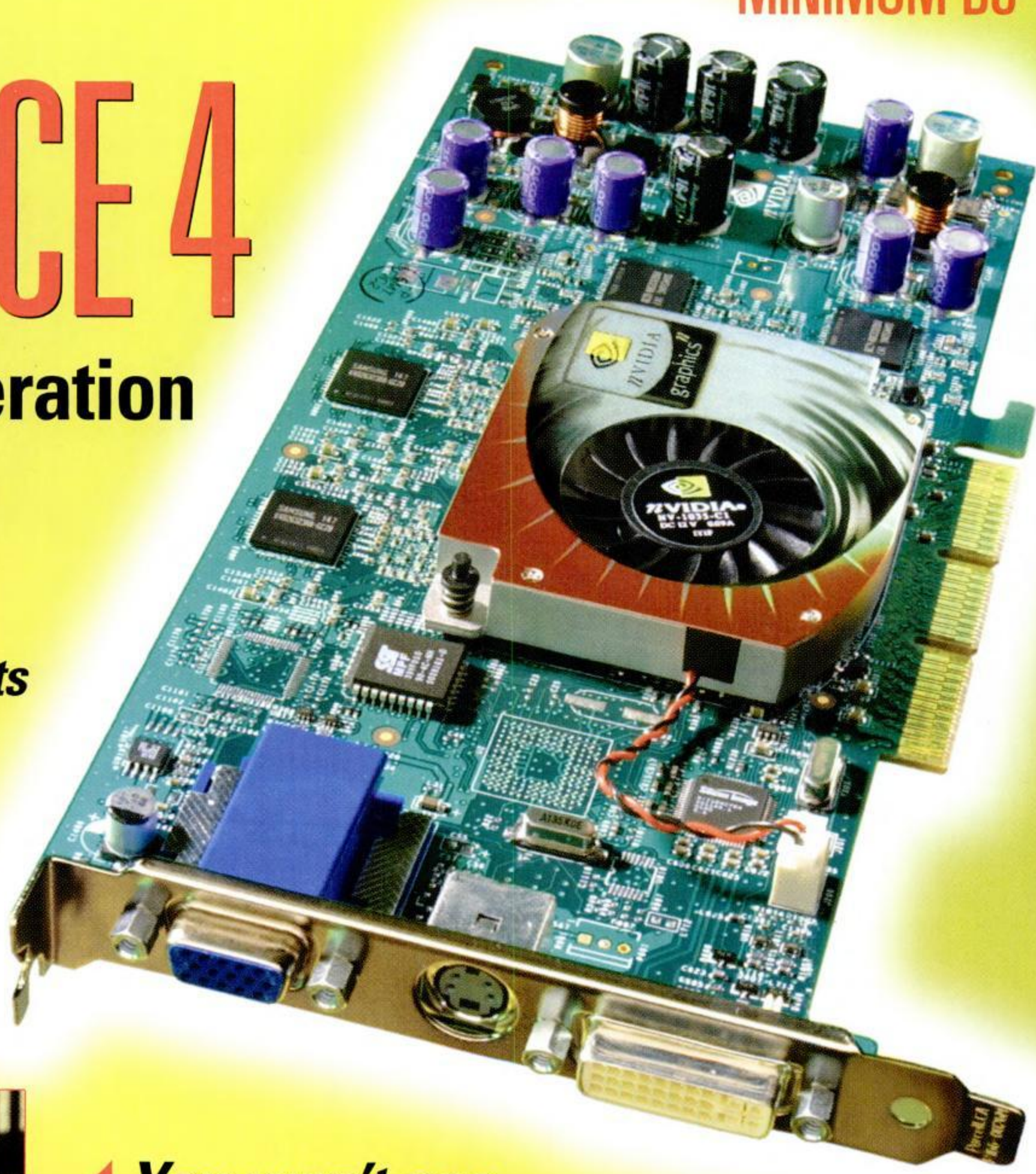

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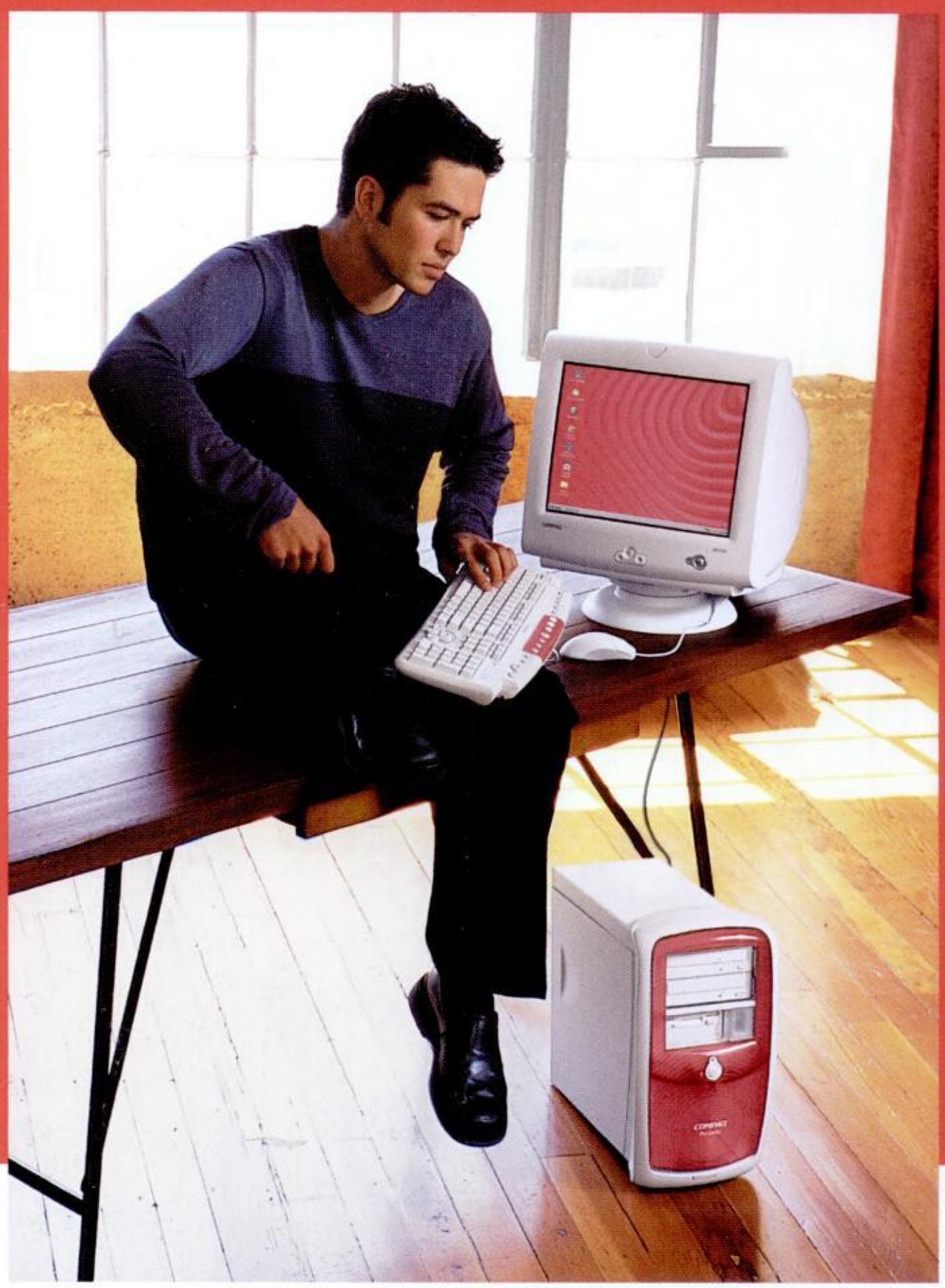

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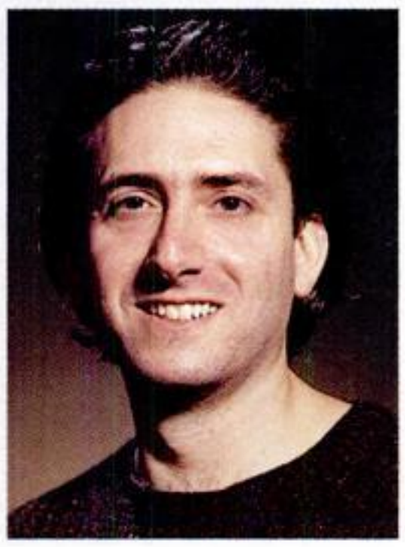

Jon Phillips says...

The answer to number 25 can be found in the fifth paragraph of this column

That this column is ever focused on a single subject is, quite frankly, amazing. See, I typically write my release notes on the final day of the magazine's production schedule, and, amid all the journalistic hub-bub, my leftover mental capacity is less than that of a fruit fly who just spent half his lifetime trying to decide whether clockwise or counter-clockwise is the most productive way to circumnavigate a decaying pineapple. So this month you get the "scattered" Release Notes, which may not strike you as very scattered if you compare it to some of the word jumbles being passed off as "release notes" by software developers these days.

▸ This month, my personal award for Best Coverline on an Imagine Media Magazine goes to the March issue of *PC Gamer* for "PC Gamer vs. the Taliban." You have to see this, folks. The boys at our sister magazine made a custom *Jane's* mission that has a *PC Gamer*–branded fighter plane bombing the holy hell out of a fleeing Taliban convoy. The duck shoot is illustrated in a screenshot vignette that should provide a moment of catharsis for gamers everywhere.

▸ And speaking of the military, I have to say that of all the positive feedback that streams into my inbox, the e-mails that delight me the most are from service men just back from September 11th–related tours of duty. The details vary, but the running theme is that these guys actually want to thank *Maximum PC* for offering them relief and entertainment during troubled times away from home. Listen, I sincerely believe that the vast majority of Americans work their asses off, and we all deserve a pat on the back. But I hold a special place in my heart for the men and women who put their lives on the line just so I can continue to enjoy my cushy lifestyle in San Francisco. The idea that *Maximum PC* is somehow helping the fight against terrorism strikes me as a bit absurd, but I'll be the last one to contradict the folks who are making such grave sacrifices in times of relative prosperity.

▸ Newsflash: We just discovered that the chronic paper jam afflicting our HP LaserJet 8000 isn't the result of some intrinsic manufacturing defect. It actually turns out that the Lil'est Intern has a taste for cat-napping inside of network printers. They're warm and cozy, and unless tray number two is filled with a full ream of paper, the littl'un can catch a few Zs before it's back to the salt mines.

▸ Finally, I must issue a blog advisory: Blogs are stupid and annoying, and I wish I could scratch off the face of the person who coined the nauseating term "blog" in the first place. A blog, you see, is nothing but an online diary—a .plan file, as it were, but nowhere near as relevant or informative as the ones created by the John Carmacks of the world. No, indeed. Blogs are usually written by culturally elitist dot-commies who think the world actually cares about their observations on Belgium lambic or last night's episode of "Buffy."

To think that anyone might care enough to read the ramblings of a self-indulgent tech nerd. Jeez.

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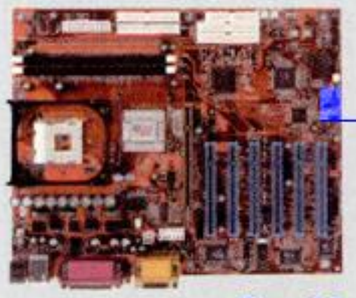

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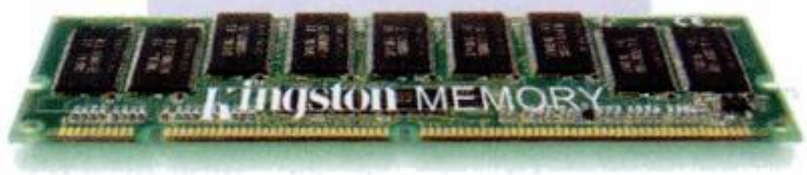

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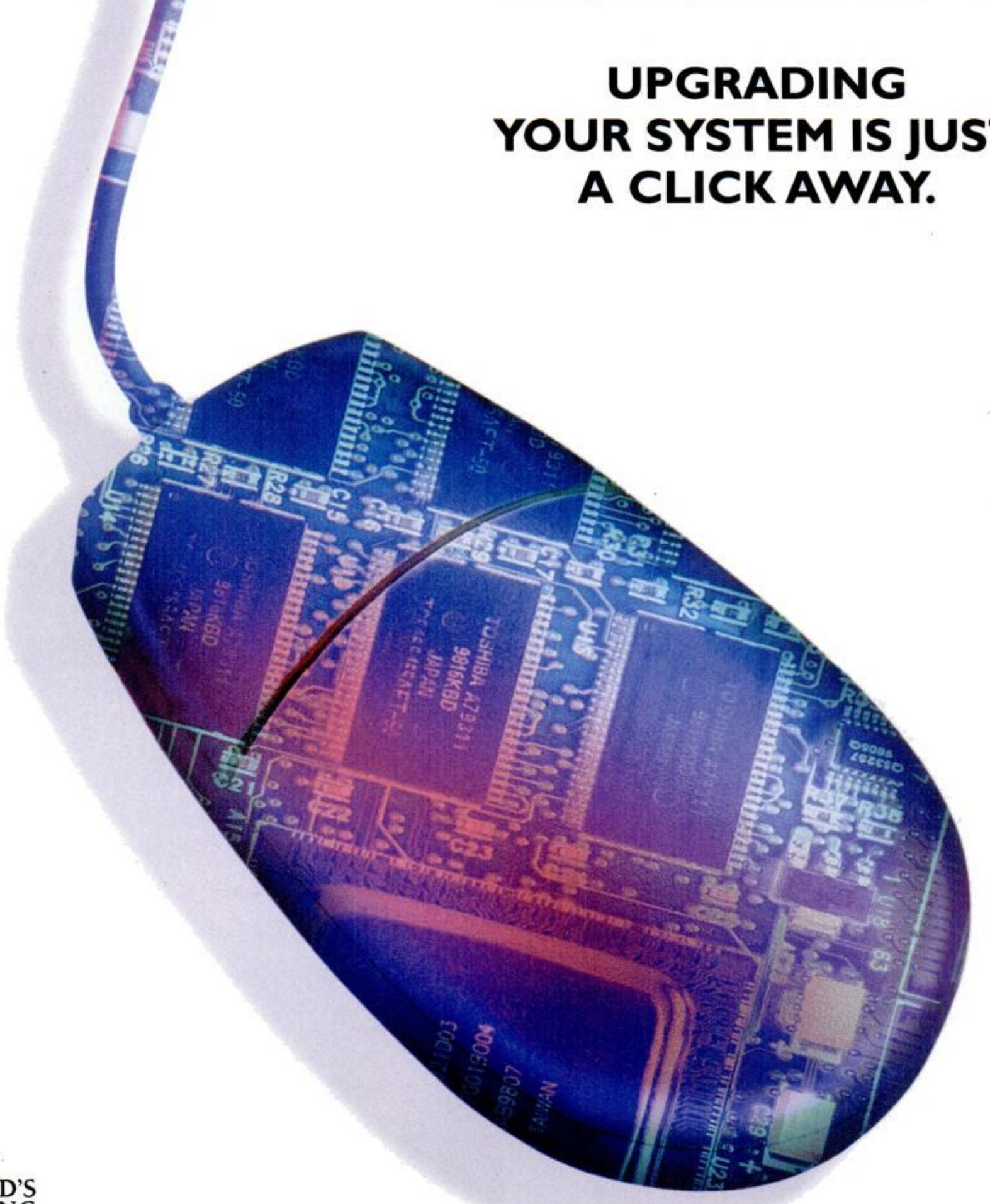

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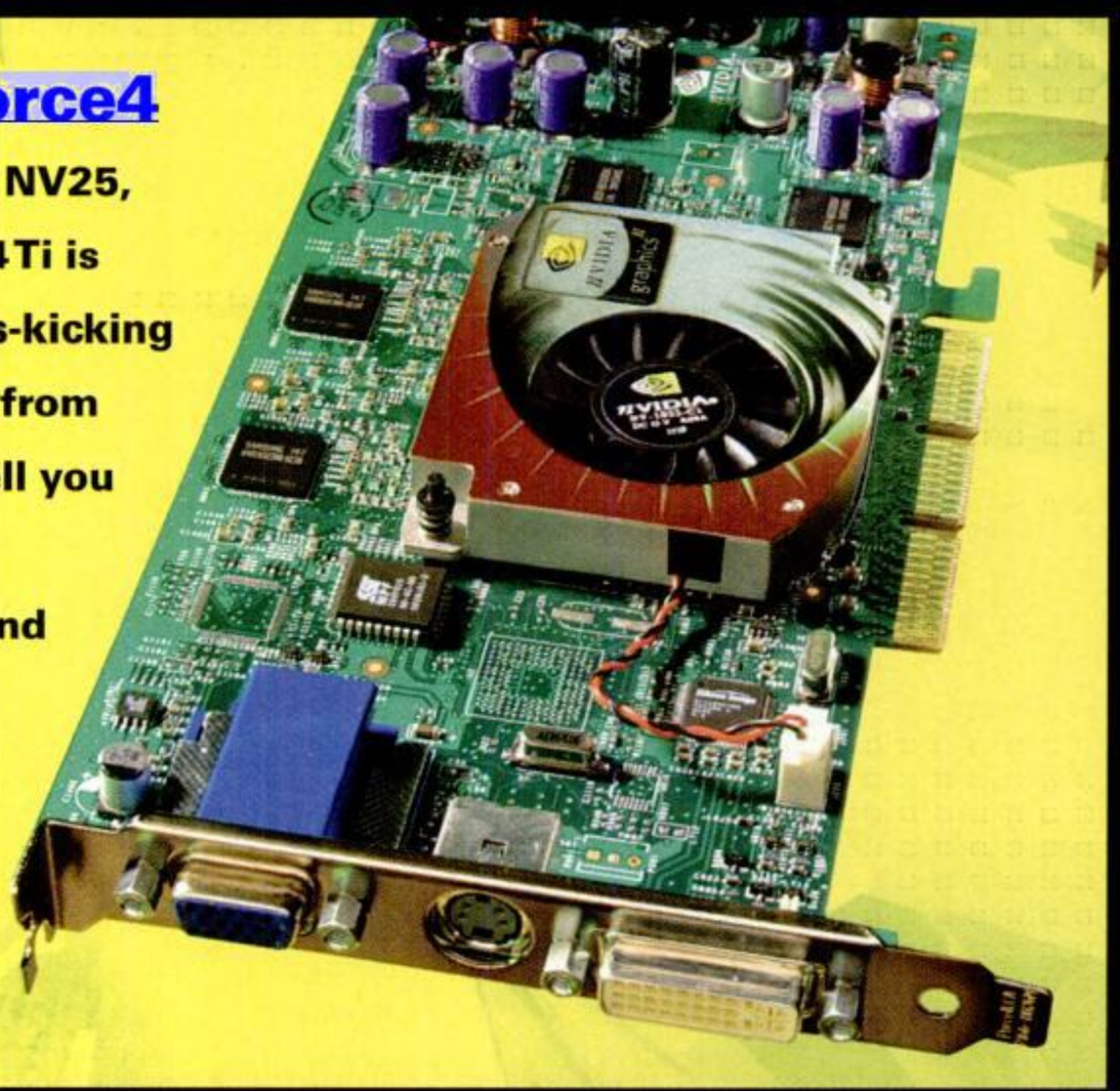
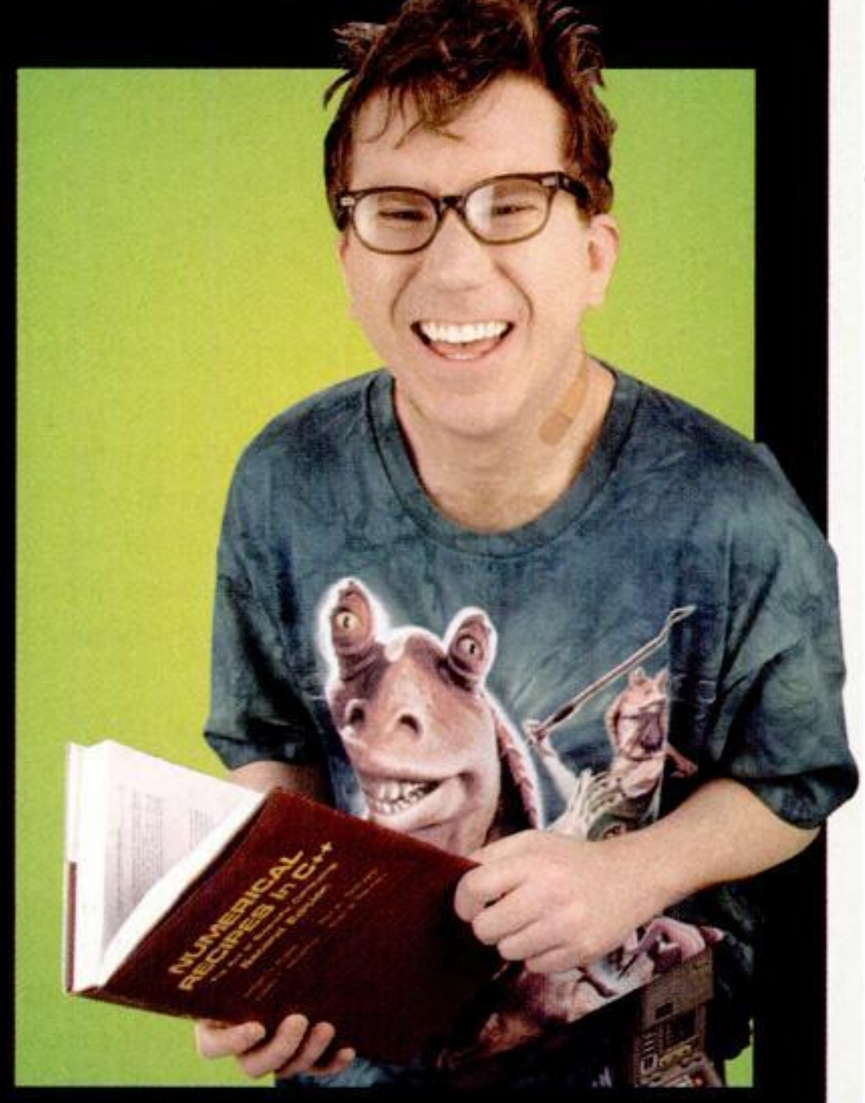


24 GeForce4

Code-named NV25, the GeForce4 Ti is the latest ass-kicking wonder chip from nVidia. We tell you what's new, what's old, and most importantly, *how fast it is!*

36 DV Cams

With prosumer-level digital video cameras becoming ever more affordable, it's time to take a closer look at what some of the reasonably priced products have to offer.



46 Geek Test

Think you've got what it takes to be a geek? Believe it or not, it's a quality that can be quantified—the score you get on our Geek Test will tell it like it is.

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In/Out

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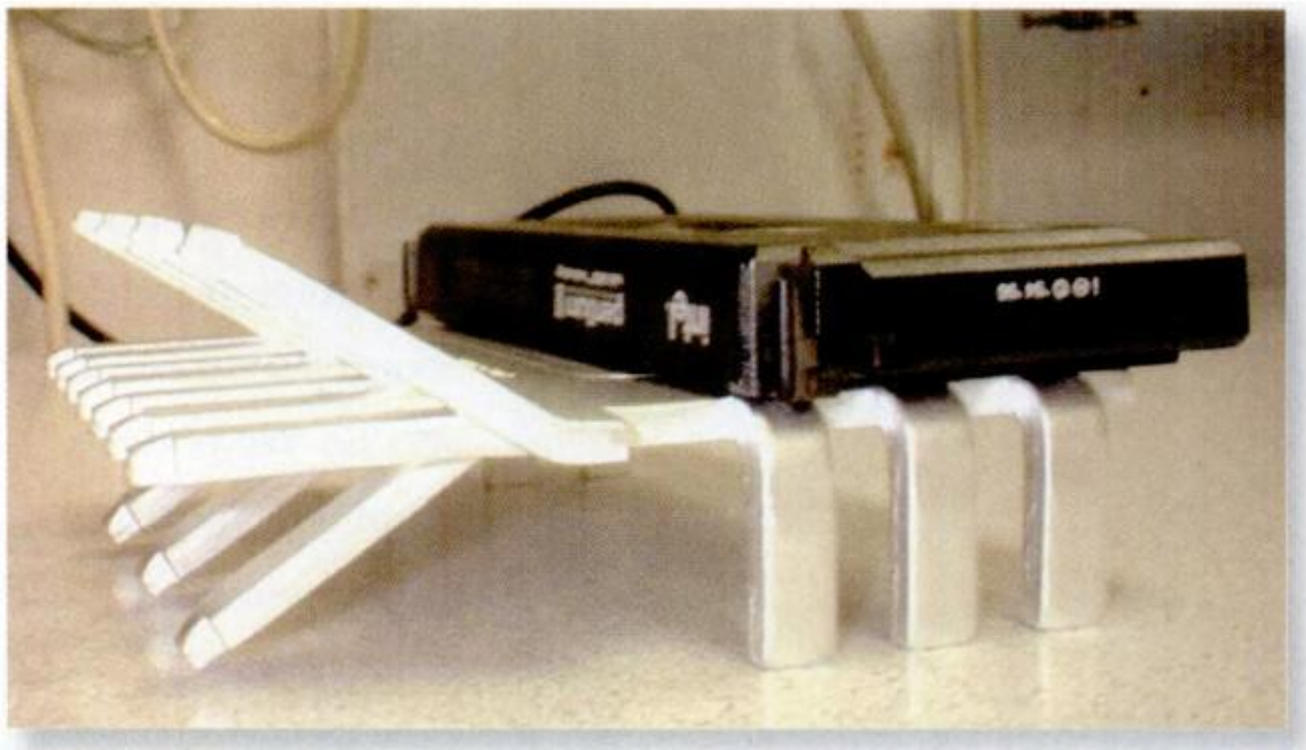
It's Alive!

As I was upgrading my boss's computer, a Compaq Deskpro, I encountered something that's either an attempt at passive cooling or some type of six-legged creature straight from a sci-fi nightmare. The thing is really sharp, too! It's designed to either scare off heat and small animals, or to walk out when you're not looking and eat any non-Intel devices in the office.

—STORM DRAGON



MODEL BEHAVIOR

What is it with you guys? Are you purposely trying to turn away your female readers? Don't you have any female staffers who can set you straight? I really enjoy your magazine, but frankly I'm getting sick of your need to make it part PC and part *Playboy*. Get rid of the buxom blondes and the sexual connotations, or you're going to lose your female readers.

—SANDY CHEVRETTE

ART DIRECTOR NATALIE JEDAY RESPONDS: I assume you're referring to our February cover. Well, I'm a female staffer and I think it was totally appropriate. When I look at our cover, I see a model who conveys health, strength, knowledge, caring, and trust. All characteristics that I would be proud to have as a human being. These are also characteristics that perfectly illustrate the confidence our readers should feel with the information provided inside the magazine.

"I'm getting sick of your need to make [your magazine] part PC and part Playboy."

RAID RE-REVISITED

I am very concerned about the RAM disk test you did to test RAID configurations ["RAID Revisited," March 02]. And it's the same concern I've had all along with *Maximum PC's* enthusiasm for RAID 0. That is, summing up the drive-array's performance with a single metric essentially rigged to show a maximum transfer rate, is not realistic. The RAM disk test unfairly stacks the deck in favor of sequential I/Os because it copies files back and forth. Real-life programs, on the other hand, do a mix of both sequential and random I/Os.

In a typical random I/O, the time to position the head assembly is much, much longer than the time needed to transfer the data—perhaps 80 times as long (8 milliseconds vs. 0.1 millisecond). In sequential I/Os (assuming there's no file fragmentation), the head assembly needs little repositioning. Therefore, a larger percentage of time goes into transferring data than into a random I/O; the transfer rate can be much higher.

For future issues, I recommend identifying categories of programs that fit into predominantly sequential patterns, predominantly random patterns, and a mix of both. For example, audio, video, and digital photo editing (at high resolutions) do more sequential I/Os. Databases typically do more random I/Os (if well-tuned). Games probably do a mix of random and sequential I/Os. Then, all that remains is selecting benchmarks that match those patterns. Understanding the difference between the I/O types is key to selecting disk hardware that best fits one's application.

—MIKE MADDOX

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: We really can't argue with Mr. Maddox's evaluation—we only wish we had him onboard when we were developing the RAM disk test. Mike is a tech journalist who has a lot of experience with RAID, and we'll be working with him in the coming months to beef up our hard drive coverage.

TOO MANY TINY DRIVES

I was shopping for a present recently, and was astounded by the number of companies selling USB keychain drives. There are easily over a dozen now with varying specs and prices. They all claim to be hassle-free and have comparable transfer speeds, but the prices vary widely. I'd love to see an article comparing these little drives.

—JAAN TALVET

FEATURES EDITOR LOGAN DECKER RESPONDS: Yes, we love our USB keychains. But there's not much to round up when comparing these devices. Basically, there are two kinds: the standard flash-memory-on-a-stick, and the deluxe flash-memory-on-a-stick with an ARM-7 processor. The advantage of the latter is that the ARM-7 chip allows the device to be used across all platforms, from WinME on, without requiring the installation of drivers. They even play nice with Macs, if you're so inclined. This is indisputably cool and worth the extra bucks.

Aside from this difference, they're all pretty much the same. Sony's Micro Vault (see page 71 for the review) is only cosmetically different from the DiskOnKey that received our Gear of the Year Award last December. Why it's almost twice as expensive is anybody's guess.

But what we really want to know is when

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The MOST acclaimed Sound Card ever!

"...the Audigy is simply the best-sounding consumer level sound card we've ever heard."

"...a perfect 10 if there ever was one."

Maximum PC
10 out of 10 Kick Ass Award

MAXIMUM PC KICK ASS PRODUCT

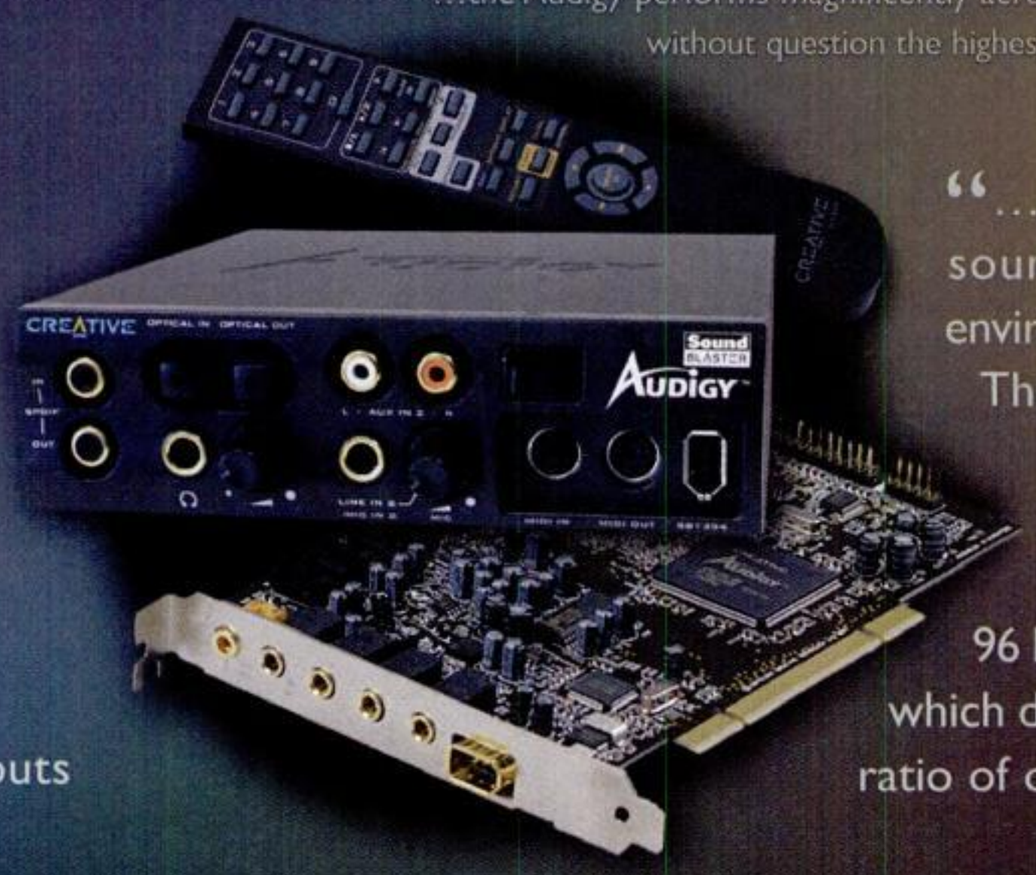
PC MAGAZINE EDITORS' CHOICE

January 29, 2002
Sound Blaster® Audigy™ Platinum eX
Creative Labs, Inc.

"Audigy boards have the richest feature set, best audio quality, and some of the most flexible connectivity options in this roundup."

PC Magazine
Editor's Choice Award

"...the Audigy performs magnificently across all game, music, and video media. It is without question the highest quality sound card available for the PC."
— GameSpot.com



"...the Audigy delivers cleaner sound and better environmental effects. The cleaner sound is the result of better mixing and a new 24-bit, 96 KHz digital to analog converter, which delivers a signal to noise (SNR) ratio of over 100 dB."

Computer Games
Editor's Choice Award

Computer Games EDITOR'S CHOICE

"...true 24-bit, 6-channel digital-to-analog converters (DACs) produced breathtaking sound and low noise levels, and the card was even able to record multiple analog inputs simultaneously."

ZDNet.com
Best Buy Award

ZDNet Editors' Choice

"These cards bring to market a host of new features, including more audio processing horsepower, a new iteration of Creative's EAX extensions for games, and perhaps most notably, FireWire."
— ExtremeTech

"The Audigy's 24-bit digital-to-analog and analog-to-digital converters simply produced better sound quality than that of all other consumer sound cards."

Maximum PC
Gear of the Year Award

GEAR of the YEAR 2001 MAXIMUM PC

PC GAMER EDITORS' CHOICE

"... Again, amazing. If you fancy yourself a fan of audio, make sure there's an Audigy in your next PC."

PC Gamer
Editor's Choice Award

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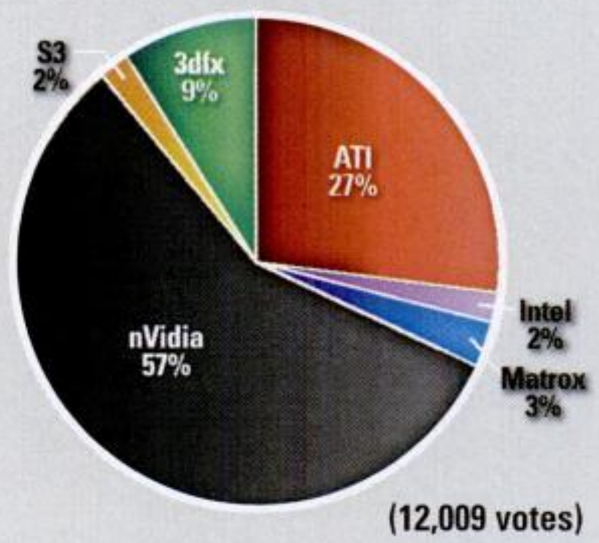
MAXIMUM PC's

READER PULSE POLLS

Your vote counts!

Please contribute to our reader polls at www.maximumpc.com.

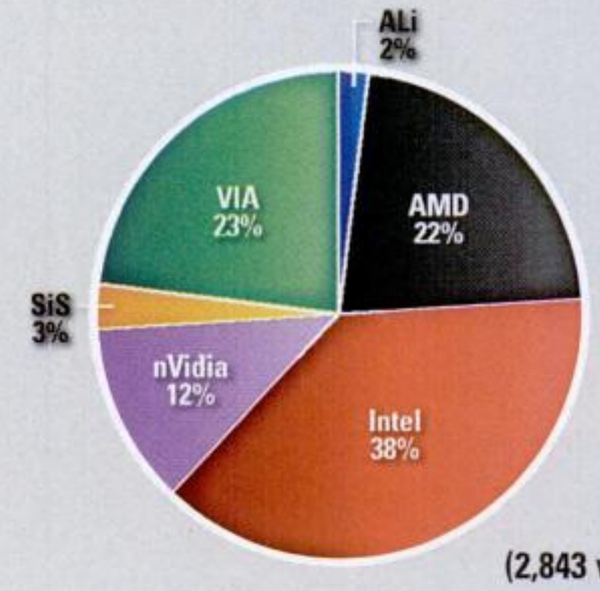
Which manufacturer made your videocard chipset?



(12,009 votes)

More than half of the readers who responded to our survey own nVidia 3D accelerators. What we want to know is: Do readers choose nVidia boards because of their speed and great driver support, or because there's no reliable alternative?

Who makes the most reliable motherboard chipset?



(2,843 votes)

This one isn't so clear-cut.... While Intel continues to hold a commanding lead, AMD and VIA are becoming close competitors. We just feel sorry for the poor schmos who own ALi and SiS chipsets.

the USB 2.0 and FireWire versions are coming to town. When they do, we'll let you know.

WE PLEAD NO CONTEST

I am a Canadian, and read your magazine every month. My complaint is that you hold contests in your magazine, and in the fine print you limit them to U.S. residents only. I have thought of calling The Dog on your butts, but we know The Dog won't bite the hand that feeds him. I feel this is unfair and unjust, as I've read your magazine every month for years now and pay a premium to do so. I would like to suggest that you hold a contest for us freezing-cold Canadians. Really, guys, with free trade and open borders, there isn't really much of a diff between our two countries other than an imaginary border with a few dudes roaming around checking cars and such. Please keep up the good work, and throw us Canadians a bone sometime.

—DAN TAYLOR

"I don't think any of your readers, including me, care about who gets their computer to you on Monday and who can't get it to you until Thursday."

IMAGINE MEDIA LEGAL COUNSEL CHARLES SCHUG REPLIES: Games of chance—that is, random drawings and sweepstakes—are illegal in certain parts of Canada (for example, the Ottawa province). In addition, we do not have the resources to deal with legal issues that might arise in countries other than the U.S. Even though the U.S. and Canada share many similarities, they are different countries with very different laws.

BETTER LATE THAN NEVER ISN'T GOOD ENOUGH

This is in response to a comment made by Gordon Mah Ung in the February 2001 letters section: I'm appalled at you saying that it's not the tech support that got Falcon a Perfect 10, but that it's because they got a computer to you first. I really don't think any of your readers, including me, care about who gets their computer to you on Monday and who can't get it to you until Thursday. It doesn't matter. What matters is the fact that they're paying over $1,500 more for something that got a Perfect 10 only because the price was intentionally ignored. You should give scores based on what's the best choice overall, and not who gets their stuff to you first.

—JASON RODZIK

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: I think you might be missing Gordon's point. He wasn't literally saying that we give OEMs extra points for speedy shipping. Whether a system arrives Monday or Thursday is not the issue. No, Gordon was commenting on Falcon's ability to serve early adopters, the consumers who absolutely must have the fastest components and lushest features ASAP. The fact remains that when parts are scarce, some system OEMs have enough pull with component vendors to leapfrog over other OEMs and secure the highly coveted videocards, CPUs, and CD burners that everyone is clamoring for. And, yes, the delays for these parts can last much longer than just a few days. The waiting game most often occurs with highly clocked chips that are experiencing yield issues—when the Pentium III 1GHz launched, the processors were harder to find than two-headed snakes. Videocards with highly clocked memory fall into the same category.

Maybe now's a good time to remind all readers that this magazine puts a premium on outrageous PC power, and that, in general, we're much more concerned with performance than price. And for what it's worth, that Falcon rig reviewed in the December 01 issue would have received *at least* a 9 verdict based on its performance and features alone. The bump to a 10 was just our way of paying homage to pure PC power.

THE GOOD, THE BAD, AND THE UNINSPIRED

I noticed that in the February 2002 reviews section you replaced the traditional "What We Like" and "What We Hate" statements with more colorful words and phrases, such as "Terminator 2: Judgement Day" and "Fried Green Tomatoes." I enjoy the fresh, comical approach, but how long do you think you'll be able to keep this going? Are there plans to keep the new style indefinitely? I estimate you'll only be able to fill 2.9 more issues with popular antonyms before you have to revert to Middle English.

—TAD MANTELL

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EDITOR IN CHIEF JON PHILLIPS RESPONDS: Hah-hah! Our Managing Editor had the exact same concern. But I have faith in the wordsmithing abilities of the *Maximum PC* staff. I'm absolutely convinced that we can come up with 12 to 15 plus/minus variations for every issue. If not, well... then Middle English it is!

THE WHOLE KIT AND CABOODLE

I noticed you forgot an important tool in your PC trauma kit [February 2002]—a "fine adjustment tool." You know, a hammer! When all else fails, it's important to put the POS out of its misery.

—MARC MORGAN

Thanks for the article on the PC medics' black bag. *Maximum PC* points out several items that I had not considered as I prepare my own. But I would also like to add a couple items I think might come in handy. For example, I carry a couple of artists' brushes. One large, long, soft-bristled brush to dust boards and such, and a shorter, stiffer-bristled brush to root out stubborn dust bunnies from nooks and crannies such as the fins of a heatsink. I also carry a battery-operated vacuum to clean up the debris generated by the aforementioned brushes. I have never opened a case that didn't need considerable clean-up. A clogged heatsink, for instance, will not perform anywhere near spec.

—GREG SNIDER

OK. What's with the little bottle of Kahlua in the kit pictured in the February 2002 issue? Is this a required accessory? I couldn't find any text referencing this particular item of the kit.

—STEVEN DEVINE

SENIOR EDITOR ARTHUR MAH BACH: Didn't we mention that those tiny slots in the trauma box also conveniently accommodate the cute little bottles of booze you get on airplanes? Besides relying on the trauma box to patch up a wounded PC, we look to it as a complete mini–wet bar. It comes in handy when you need to christen a new machine; plus, a snoot of Jack Daniels can help ease the pain when its 2 a.m. and your PC just won't POST no matter what you do.

MAXIMUM PC READERS ASK: ARE WE CRIMINALS?

"Know Your PC Rights" (January 2002) was a very informative and well-written article. However, there is one issue that I'm still unclear on. Removing the CD-check by downloading and installing a "fixed executable" was reported as illegal since it modified the program. However, what about using optical drive emulators to solve the same problem? For example, I have loaded many games on my laptop. Rather than toting all the CDs around in case I want to play one of the games, is it legal for me to install a program that takes a portion of the hard drive and makes it appear as though it's a CD-ROM drive? This would not be tampering with the game program itself. You would think that there would be a way to be able to play all these games that are legally purchased and being used in a legal manner without having the additional burden of toting CDs around with you everywhere just to play the game!

—ANDY YOUNG

LOGAN "THE NARC" DECKER RESPONDS: If you were to go by the letter of the Digital Millennium Copyright Act, the answer would probably be a resounding *no*. That's because the DMCA says: "No person shall manufacture, import, offer to the public, provide, or otherwise traffic in any technology... that is primarily designed or produced for the purpose of circumventing protection afforded by a technological measure that effectively protects a right of a copyright owner...." Presumably, the downloading and use of a CD-ROM emulator *for the purposes of circumventing copyright protections* is verboten. However, downloading this same software for emulating non-copyrighted CDs is presumably OK. So is the damn software illegal or not? That's the beauty of the DMCA—only your litigator knows for sure.

The license agreement for some software actually permits installation on both a home PC and a laptop, as long as only one is being used at a time. Our take on it is that as long as you aren't trying to use pirated software, it's unlikely anyone will hunt you down and shoot you for using an emulator.

THAT WAS THEN AND THIS IS NOW

In your November 2000 issue you had an article about the best computer/stereo system that money could buy ["Ultimate Home Entertainment PC"]. I wonder, now that it's been over a year since the article was written, if there are any new recommendations for parts?

TECHNICAL EDITOR WILL SMITH RESPONDS: A lot has changed since November 2000 when we wrote the "...Home Entertainment PC" story, and there are a few things we'd definitely change. First, we'd be sure to use an All-in-Wonder Radeon 8500 or Personal Cinema–equipped nVidia card, such as the Visiontek Xtacy Everything. We'd also use a Sound Blaster Audigy instead of the old SB Live! 5.1, as well as a good set of PC 5.1 speakers, such as the Klipsch Promedia 5.1s, instead of a dedicated home theater speaker rig. As for the Pioneer plasma display, there's nothing we love more.

MY GOD, WHAT HAVE WE DONE?

"In the Lab" (February 2002) demonstrated how you attempted to create a being in your own likeness by pouring salt onto a motherboard (hell, you even used Morton's Iodized Salt). But in the rush of putting out your awesome magazine, you forgot to hook up the Barbie doll. If you look closely in your Lab gestation pod, you will see that instead of creating the geek of your dreams, you actually cloned... *Jared, that annoying guy from the Subway commercials!* Just thought I'd point it out.

—RICK POOL

"A snoot of Jack Daniels can help ease the pain when its 2 a.m. and your PC just won't POST no matter what you do."

DR. LOGAN DECKERSTEIN RESPONDS: It's funny you should mention that, Rick. In our first attempt to clone the perfect intern, we actually did include a Barbie doll in the original recipe. But in the classic tradition of sinister experiments gone awry, instead of creating the ultimate Lab assistant, we inadvertently cloned...actress Andie McDowell! ■

LETTERS POLICY: ***MAXIMUM PC*** invites your thoughts and comments. Send them to **input@maximumpc.com**. Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

CUT, COPY, PASTE

In our IDE vs. SCSI feature (March 2002) we mistakenly reported the external temperature of the SCSI drive as being 116° C, when in fact we meant 116 ° F. So sorry.

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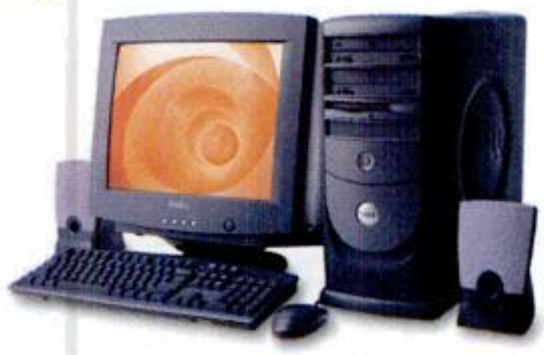
Dell | Home Desktops



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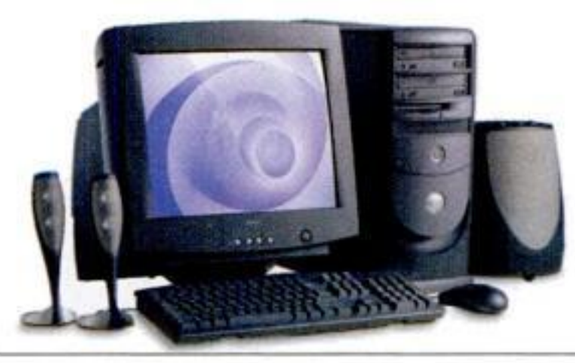

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- 6 Months of DellNet™ by MSN® Included[10]
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- Inspiron Notebooks shown here include 1-Yr Limited Warranty;[2] 1-Yr Mail-In Service, 1-Yr 24x7 Phone Support

Dell | Solutions

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- HP ScanJet 4470Cse, $149

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AGP Gears Up for Another Speed Bump

Is 8x the last stop for your videocard bus?

With ever-faster videocards and more bandwidth-intensive games on the horizon, Intel and the leading graphics vendors are preparing to double the speed of the AGP bus from 4x to 8x.

AGP 4x was first introduced in 1999 with VIA's Apollo Pro 133 chipset, then followed by Intel's 820 chipset. The jump to 8x will increase bus throughput from about 1GB/sec to 2.1GB/sec. The bus frequency will remain at 66MHz, but like the double-pumped and quad-pumped busses for the AMD and Intel flagship CPUs, AGP 8x will be "octal-pumped." That means it will send eight pieces of data every sweep of the clock.

To support AGP 8x, videocards will also have to support new 0.8-volt signaling, which is much lower than the current 1.5 volts drawn by AGP 4x. AGP 8x videocards will use the exact same 1.5-volt slots designed for AGP 4x, but will be smart enough to sense when they're being inserted into older motherboards that don't support AGP 8x data rates. When an 8x videocard is inserted into a 4x slot, the card will either run at AGP 4x data rates or issue a warning message stating that it won't work in the motherboard (which scenario occurs is determined by the card manufacturer). AGP 8x motherboards will be just as smart in detecting the presence of a 4x videocard.

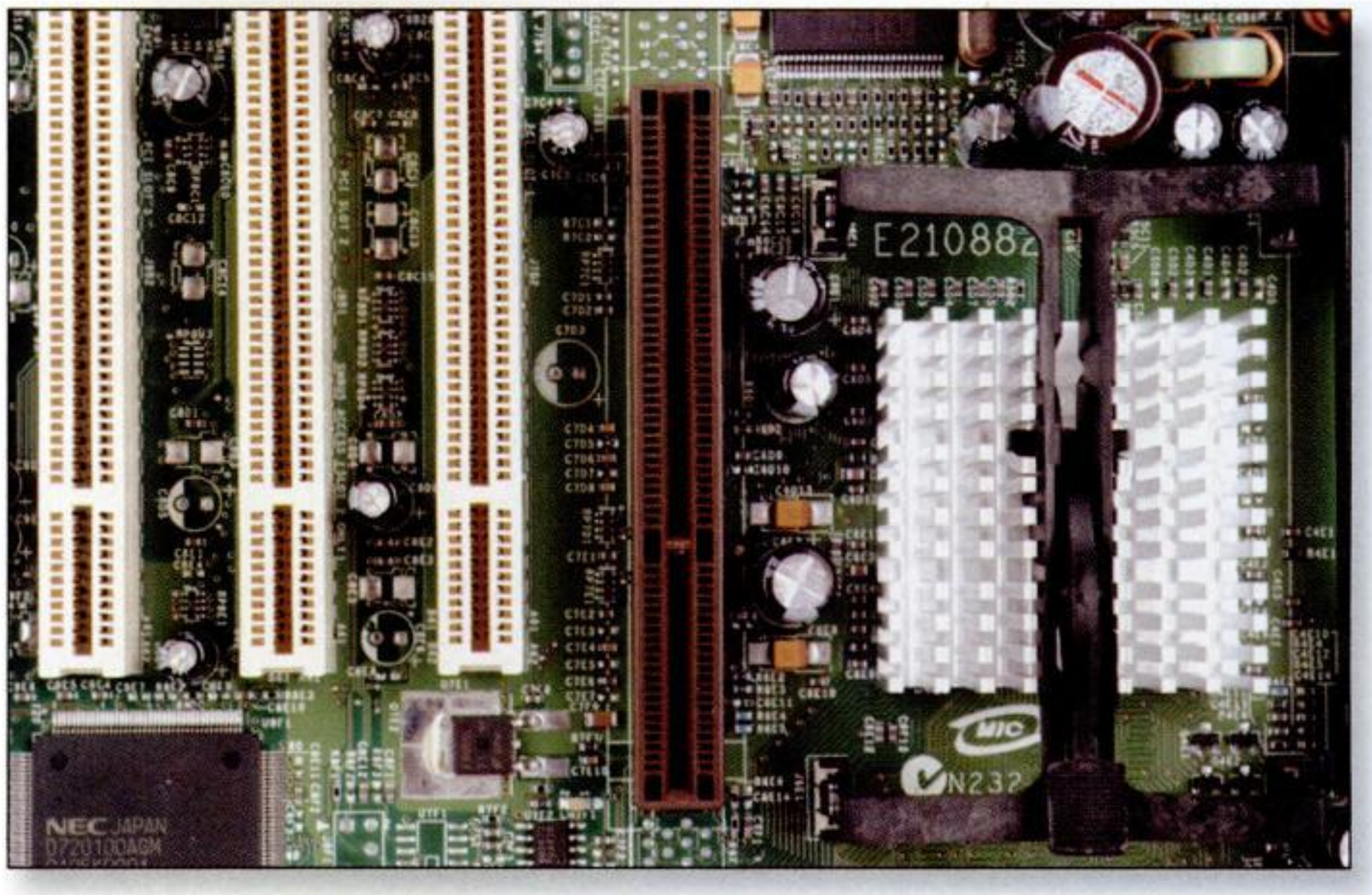
"When AGP was first introduced... it was sort of like paying for a 10-lane highway when the local traffic barely filled a two-lane boulevard."

THE AGP MODUS OPERANDI	
1x	266MB/sec
2x	533MB/sec
4x	1.07GB/sec
8x	2.10GB/sec

Intel says the added bandwidth of AGP 8x will provide necessary headroom for 3D videocards of the future, but concedes that the extra speed is overkill for today's typical desktop user. This evaluation harkens back to 1997, when the accelerated graphics port was first introduced.

Back then, the PCI bus wasn't yet showing signs of choking on bandwidth congestion, but the PC industry knew that congestion was imminent. Lest we forget, the PCI bus hosted not only graphics data, but also the data of any add-in card that might be plugged into the motherboard. Enter AGP, which moved all graphics data to a private, high-speed turnpike. With AGP, your videocard has point-to-point access to your CPU and memory and doesn't have to suffer the congestion of rush-hour data traffic. Nonetheless, when AGP was first introduced, it didn't show much utility. Implementing it was sort of like paying for a 10-lane highway when the local traffic barely filled a two-lane boulevard. Even up until 1999, PCI cards often performed on par with AGP cards in real-world applications.

Regardless, Intel says it makes sense to build wider roads before traffic gets too bad. That said, AGP 8x is actually on hold for Intel's consumer chipsets until 2003, though this year the company will integrate AGP 8x into its workstation chipsets, which need to handle the bandwidth loads presented by CAD, 3D rendering, and scientific applications. Intel's foot-dragging on AGP 8x consumer chipsets may actually play into VIA Technology's hands. VIA is reportedly considering AGP 8x support in its upcoming consumer chipsets, even though the spec has not yet been finalized.



AGP 8x slots should look identical to AGP 4x slots, despite offering twice the bandwidth.

InQuest analyst Bert McComas agrees that AGP must evolve, but doesn't believe that all the motives for doing so are noble. McComas says the push for AGP 8x will initially be just another way for PC and videocard vendors to tout products as being "X-times" faster than before.

This month, an independent industry-standards board will review and vote on the AGP3.0 specification, which adds AGP 8x data rates. ATI and nVidia have already pledged support for the spec. AGP 8x will likely be the final stop for AGP. Beyond AGP, Intel is promoting Serial AGP, which is expected to hit 2.5GB/sec of bandwidth and appear sometime in 2004.

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Pentium 4 Goes Mobile

Look for the 'M,' Intel warns

Mobile gaming will get a speed boost this month when PC vendors start selling the first notebooks that use a portable version of the Pentium 4. Interested? Then you better make sure your notebook has an authentic mobile P4. Intel says desktop P4s jammed into notebooks will only cause you grief.

Intel is warning road warriors to not only look for the P4 logo when they buy notebooks, but also an "M"—signifying mobile—on the logo (see picture). The advisory is part of an Intel campaign to warn consumers that notebooks using the desktop version of the CPU could provide less than half an hour of battery life. For what it's worth, some notebook vendors have contradicted Intel, telling us it's possible to keep battery life to an acceptable level with desktop CPUs.

Intel says true mobile parts can be designed to produce less than 30 watts, while a desktop processor can produce up to 65 watts. So why would a notebook vendor even chose to use a desktop CPU instead of the mobile one? Lower cost and greater availability. If you're a small notebook vendor, using the desktop P4s might help drive sales and profits.

The first Pentium 4M CPUs should hit the circuit at speeds up to 1.7GHz and will be coupled with Intel's 845 DDR chipset. The 4M is a derivative of Intel's Northwood Pentium 4 and uses the same 0.13-micron process, but enables lower power usage and produces less heat. The mobile chip is expected to eventually reach 2GHz.

Double Data Rates, On the Double

New memory technology promises tomorrow's speed today

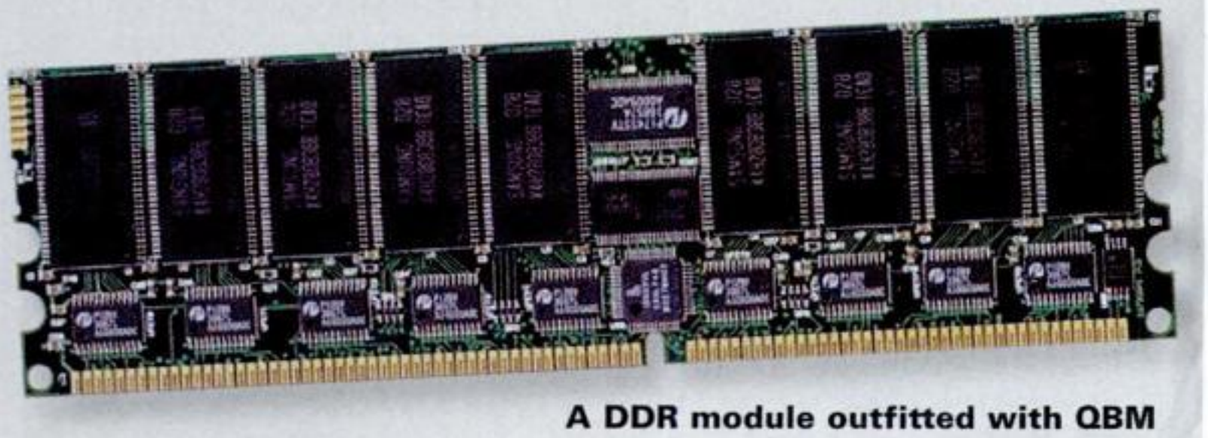
Forget DDR, the oh-so-fashionable memory speed–doubling technology. The next big thing may well be quad band memory (QBM), which promises to double the speed of DDR memory without denting your pocket book.

When, you ask?

Why, as early as this summer!

Created by Kentron (**www.kentrontech.com**), QBM is a proprietary signaling technology that can be added to existing module designs and chipsets to increase peak bandwidth to 4.2GB/second (when used with DDR266 modules). The technology can also be applied to faster DDR modules when they're released. QBM plays with the synchronization of the system clock to pack more data into each clock cycle. Kentron says QBM can be added to today's chipsets and DIMM modules fairly easily and at low costs.

QBM is proprietary, but it likely won't incur the animosity that Rambus experienced when it launched a few years ago. Kentron says QBM should add just $10 to the cost of modules, and the price will drop over time. And "to ensure backwards compatibility with DDR modules at the system level," says a Kentron press release, "QBM was designed with the standard 184-pin DIMM outline." Sounds promising; we can't wait to drop one in.



A DDR module outfitted with QBM

FAST FORWARD BY TOM R. HALFHILL

Will USB 2.0 Extinguish FireWire?

Wouldn't it be great if everything that plugs into a PC had one standard interface? Just think—no more fumbling around with separate cables for serial, parallel, SCSI, IDE, USB, PS/2, and IEEE-1394 ports. *Yeah*, and wouldn't it be great if we had world peace and 2GHz CPUs that grew on trees?

Realistically, no single I/O interface is optimal for every kind of gizmo we'd like to plug into a PC. The bandwidth (data capacity) and latency (response time) requirements are too varied. But USB 2.0 is making a fair try.

USB 2.0 is the first major upgrade since USB appeared in 1995. Although USB stands for universal serial bus, it never stood a chance of becoming truly universal because it's not fast enough for high-bandwidth devices, such as DV (digital video) cameras, hard disk drives, and high-performance CD-RW and DVD burners. A rival standard, IEEE-1394 FireWire, has taken root in those applications. While today's USB 1.1 peaks at a relatively pedestrian 12 megabits per second (Mbps), FireWire reaches 400Mbps.

At 480Mbps, USB 2.0 is 40x faster than USB 1.1. More important, it's backward-compatible with USB 1.1 and has special features to accommodate slow and fast devices without sacrificing performance. That isn't easy. Response-sensitive devices, such as keyboards and game controllers, need trifling amounts of bandwidth but have strict latency requirements. Bulk-data devices, such as printers and scanners, require mucho bandwidth but can tolerate longer latencies. Audio, video, and telephony devices have rigid bounds on both bandwidth and latency. Allowing all of them to share the same bus without collisions is like accommodating bicycles, tractor-trailer trucks, and sports cars on the same highway.

USB 2.0 meets the challenge. It reclocks the slower data traffic to avoiding bogging down faster devices, and it guarantees the delivery of time-sensitive audio/video data —a feature called isochronicity. By assigning different priorities to packets of data from different devices, USB 2.0 gives isochronous packets their own car-pool lane. Although USB 1.1 is isochronous, it's starved for bandwidth.

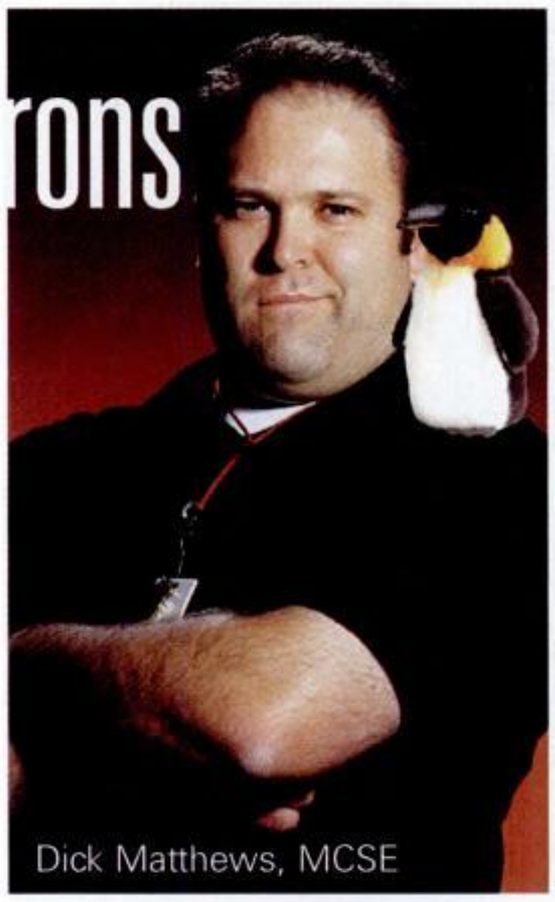
Theoretically, USB 2.0 could replace almost any interface on a PC except the IDE bus. In reality, too many camcorders and DV accessories have already adopted FireWire. For everything else, though, USB 2.0 is almost certain to be hotter than FireWire— especially since it's strongly backed by Intel and will be built into every PC motherboard.

Tom Halfhill was formerly a senior editor for Byte *magazine and an analyst for* Microprocessor Report. *He is now a technical writer/analyst in Silicon Valley.*

HELPFUL HINTS

~~Windows~~ Linux Tips for Morons

Real Power Users Pimp the Penguin


Dick Matthews, MCSE

The other day, I was sitting on the john performing my morning ablutions, when I finally saw the light. I realized that the only way for my company to achieve enlightenment —and the only way to redeem my tortured soul—was to convert all the PCs within my domain to Linux. To commemorate my conversion, this column will now be known as *Linux* Tips for Morons—so let's get started.

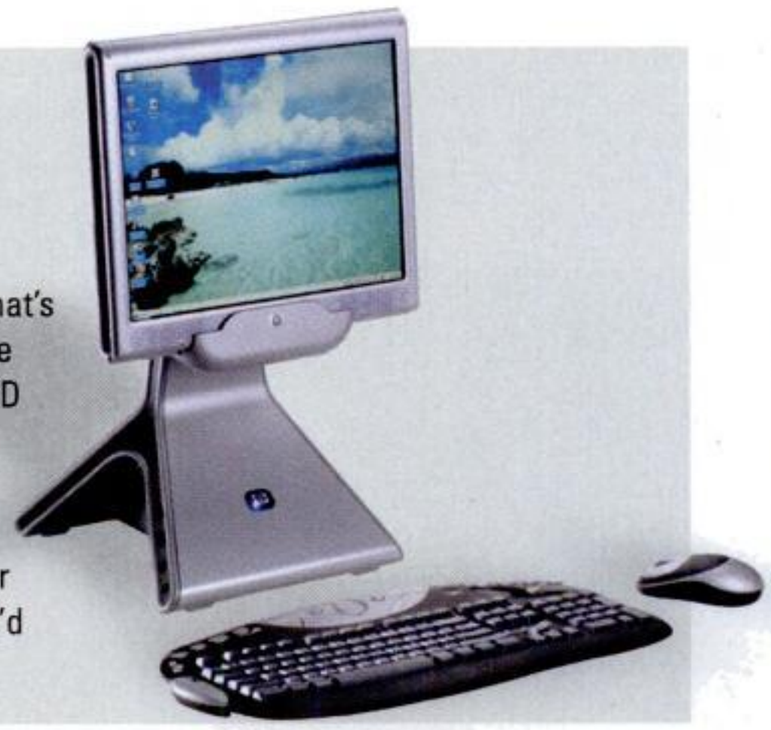
The most important Linux command to learn is **grep**. Grep is used to search for text substrings within a file. For example, typing **grep Dick tips.txt** will return all the lines in your tips.txt file that have the string Dick. Remember, Linux is case sensitive, so searching for Dick and searching for dick will yield different results.

You can also use grep to search for a file that contains a text string. For example **ls | grep Dick** will return all the files in the current directory that have the string "Dick" in them. This is really handy for finding lost files on a hard drive.

Like any good search utility, grep also uses wildcards. The dot wildcard (.) is the one that represents a single character. So, if file.txt has the words duck, dock, and dreck, and you type **grep d.ck file.txt**, then your search will return duck and dock, but not dreck. A search using the multicharacter wild card (*)—such as **grep d*ck file.txt**—will return duck, dock, *and* dreck.

That's enough Linux fun for you numbskulls. Speaking of numbskulls, that mental incompetent Phillips screwed up my column last month when he was "editing" it, as if any of the gospel that spews forth from my fingers needs editing. So, to correctly return the idiotified Windows XP search function to the more usable Windows 2000 screen, use regedit to create a new String Value in **HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\CabinetState** named **Use Search Asst**. Set it's value to **no**. Apparently, Phillips didn't make it clear that you *don't* put the periods in the Registry keys or in the values you set in them. Also, every single person who wrote in explaining that you can get rid of the dog by clicking a UI checkbox is forbidden from reading my column for one year. Uncle Dick never edits the Registry when a change can be made in the UI. Next time, before you write nasty letters about me, make sure you know what you're talking about. *Dumbasses*.

Call it a Convertible



Hewlett-Packard is toying with a concept PC that's both a notebook *and* a desktop. To convert the notebook into a desktop, simply swivel the LCD panel around and fold it over the keyboard before inserting it into the dock. HP hasn't said when, or even if, it would produce such a notebook, but believes people would be interested in a computer that pulls both chores. We certainly know that we'd like to get one in the Lab.

FUN-SIZE NEWS

Disposable DVD Movies

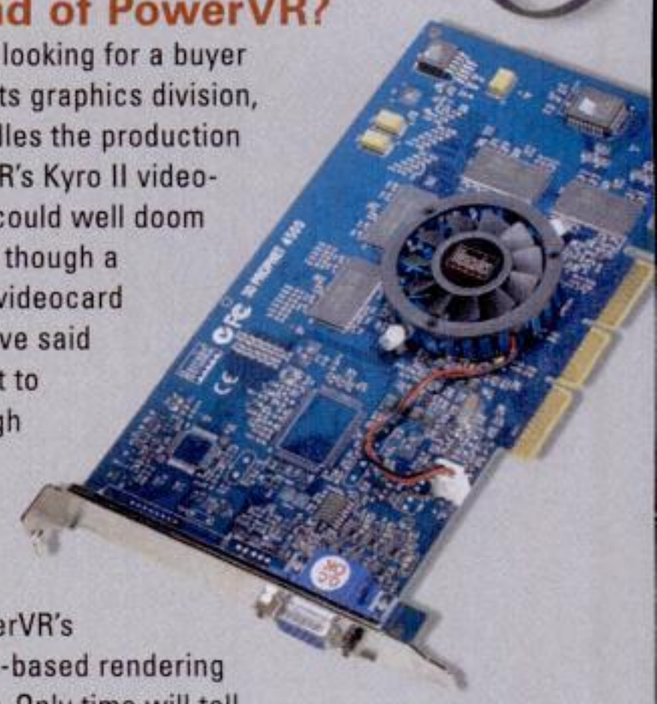
SpectraDisc (www.spectradisc.com) is developing DVD media that begins to decay after you open the package and stops working after a few days. The technology is intended to compete with other pay-per-view schemes and will let you buy a movie at the grocery store for a few dollars, then toss the disc when it's run its course. Unlike the failed DIVX format, it won't require special hardware, nor will it snitch to Big Brother what movies you're watching.

Underwater PDA

Need to check your contact database right after a good snorkel? Aquapac's new waterproof bags let you take your PDA to the beach without living in fear that a rogue wave may kill your precious handheld. Aquapac (www.aquapac.co.uk) also makes cases for GPS units, digital cameras, and phones.

The End of PowerVR?

STMicro is looking for a buyer to take on its graphics division, which handles the production of Power VR's Kyro II videocard. This could well doom the Kyro II, though a number of videocard vendors have said they expect to have enough chips to keep selling boards using PowerVR's unique, tile-based rendering technology. Only time will tell.



Blue Laser Spec Finalized

A consortium of nine companies has agreed on a uniform specification for upcoming blue-laser DVD recorders. Samsung, Thomson Multimedia, LG, Sony, Panasonic, Philips, Pioneer, Sharp, and Hitachi have all agreed to cooperate on the standard. Recorded with a shorter wavelength than traditional red-laser media, blue-laser discs are expected to hold about 27GB per side. The new burners and media could possibly arrive as early as next year.

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John Dvorak

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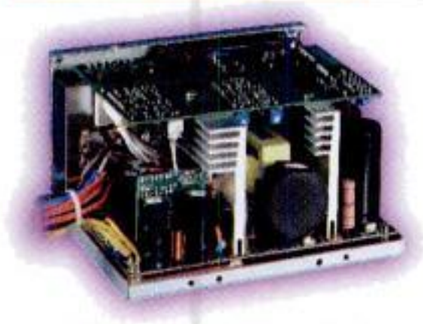

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TURBO-COOL 350 ATX
TURBO-COOL 450 ATX
TURBO-COOL 450 A4 (Tyan 2462, 2468)
TURBO-COOL 450 XE (SuperMicro P4DC6, DCE)
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The innovative **SleekLine™ 1400 Mini 1U Computer** features Intel's high-performance Micro-ATX Server Board and the amazing Intel Tualatin processor with **512K cache** (that's double the cache of a Pentium 4)!

PERFORMANCE COMPARISON

COMPUTER	SIZE (cu. in.)	PERFORMANCE[1]
SleekLine™ 1400	525	115 (w/XP)
Dell™ 8200 (2GHz)	2087	106 (w/XP)

[1] As measured by PC WorldBench 4 (higher no. is better).

SleekLine comes with 256MB SDRAM, 40/100GB hard drive, built-in 10/100 Ethernet, high-resolution 3D graphics, and a **versatile, space-saving**, USA-made enclosure that can be mounted, stacked, or carried!

SLEEKLINE 1000 (ASUS M/B, 1GHz Pentium III)
SLEEKLINE 1400 (Intel M/B, 1.4GHz Tualatin)

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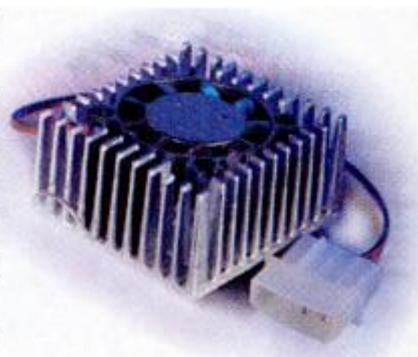

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CPU-COOL 1U (Pentium III, FC-PGA,1U)
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CPU-COOL Z1-H (K6-2, K6-3)
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TURBO-COOL® 2X AIR PROPULSION SYSTEM
BUSS-COOL DUAL-FAN CARD COOLER
VIDEO-COOL GRAPHICS CARD COOLER
SILENCER® AUXILLARY BALL-BEARING FAN
110 ALERT® OVERTEMPERATURE ALARM
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GAME THEORY

BY THOMAS L. McDONALD

But Can You Pay with Imaginary Money?

Richard Garfield and Wizards of the Coast created one of the genuine gaming phenomena of the 20th century with *Magic: The Gathering*. Setting aside the fact that it's a brilliantly designed game (and it is), the real genius lay in the collectable angle. People were investing *thousands* of dollars in cards. They didn't *have* to do this. The game is playable with two basic decks, but the collecting aspect has a powerful pull. It made *Magic* huge, and gave us the Johnson's Baby Aspirin of collectable-card gaming, Wizards' even-more-successful *Pokemon*.

Magic **has made forays into the computer realm before. MicroProse created a fairly successful PC version, with the subsequent online edition attracting a decent following. Now Wizards is ready to cash in on the massively multiplayer boom with an all-new *Magic: The Gathering Online*. Their approach is either daring or doomed, depending on your level of cynicism. *Magic* will be sold as a retail product for $15, which includes the software and a 60-card virtual "deck." Players can create an account and play with this single deck as much as they want without any monthly fee.**

Or, **they can buy cards. Not real cards, mind you. Virtual cards, bought in the Wizards store for actual money: $9.95 for a 60-card deck, less for booster packs. Once bought, cards may be used in *MGO*, traded, or even sold on eBay.**

But will the same people who shell out $10 a month for *EverQuest* adjust to the notion of buying virtual cards? After all, *EverQuest* never existed outside of a pay service, but tangible *Magic* cards can be found in any mall. Creating an intangible counterpart creates a huge, potentially insurmountable, perception problem. People need to be convinced they're paying for servers and player matching, not imaginary cards. One alternative would be a sliding subscription scale: unlimited free play with 60 cards, $5 a month for a deck and booster pack, $10 for two decks and boosters, and so on.

However they do it, they'll have a hard sell. *Magic: The Gathering Online* is well-designed and addictive as hell, with a huge potential to cross over to a non-gaming audience. Games can be fast yet complex, offering fantasy combat with low bandwidth needs and a short learning curve. Whatever the merits of the game, Wizards faces an uphill battle persuading people to accept a whole new payment model for online gaming when some are still dubious about the original one.

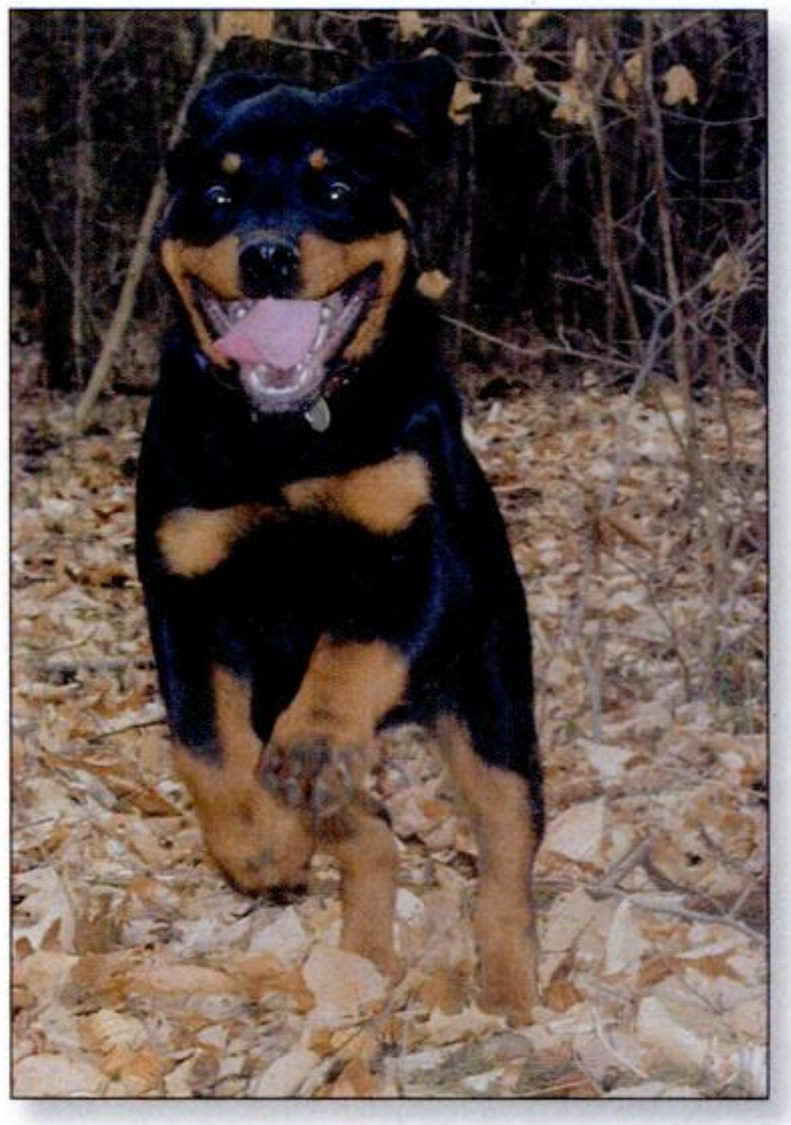
• • • • •

Thomas L. McDonald's gaming weblog can be found at http://gameguys.blogspot.com.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

12 for the Kennel

Say woof to our new WatchDog mascots



First off, we want to thank everyone who submitted photos for our WatchDog mascot contest. We received about 200 entries, but alas, only 12 dogs could win. That's right, we decided to pick 12 entries to appear in the logo of our consumer advocacy column, one dog for each month of the year. This month, Diamond—peppy friend of Roger Mathisen—stands guard. You can see Diamond at right, as well as on page 21. We've already notified the other 11 winners, but you'll have to read a year's worth of magazines to see all the pics!

And who's the agua-loving feline? That would be Peanut, friend of Jennifer Dorsett. This cute little tabby isn't WatchDog material, no, but we couldn't resist running Jennifer's submission. Apparently, this cat begs for the faucet at night! Peanut lends a new definition to the term "water-cooling," though we wouldn't want her playing in our cases.

Can Your CD-Burner Do This?

Yamaha teaches old drives a new trick

If you've ever looked at a CD that's been burned to less than its full capacity, you know that the burned area toward the center of the disc appears lighter in color than the unused portion on the edge of the disc. Well, the smarties over at Yamaha have developed a technique that will allow you to burn visible images onto the unused portion of a writeable CD!

Details are still sketchy, but it appears that Yamaha pulled off the trick by refining control of its burner's laser strength, allowing it to quickly and sharply modulate its pulses as a disc rotates underneath. This creates a sequence of burned and unburned areas with the precision necessary to create a detailed image. No products have been announced yet, but with a cool-factor of four to the tenth power, we'll keep an ear to the ground for any word on drives that "draw."

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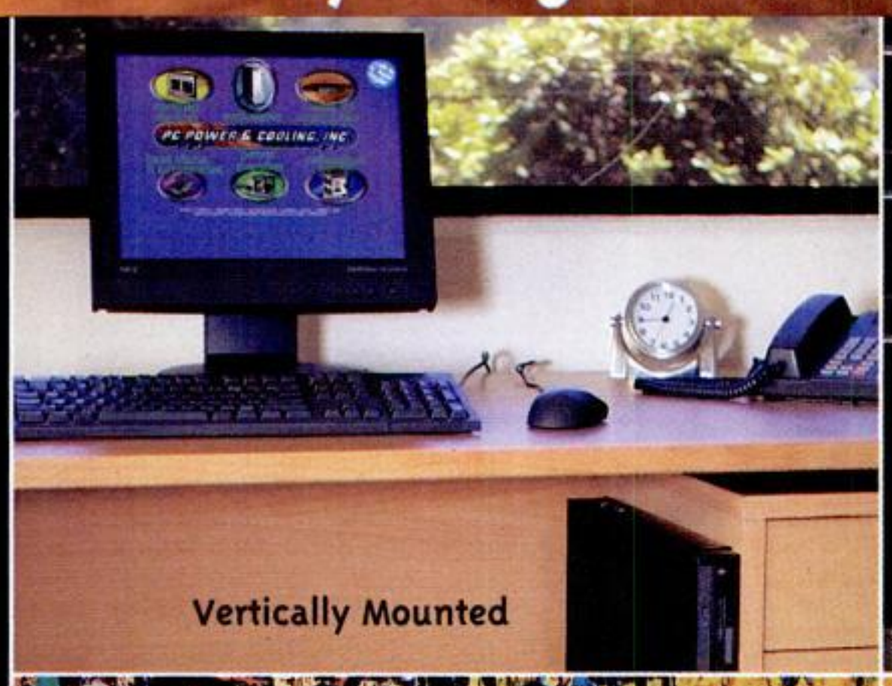
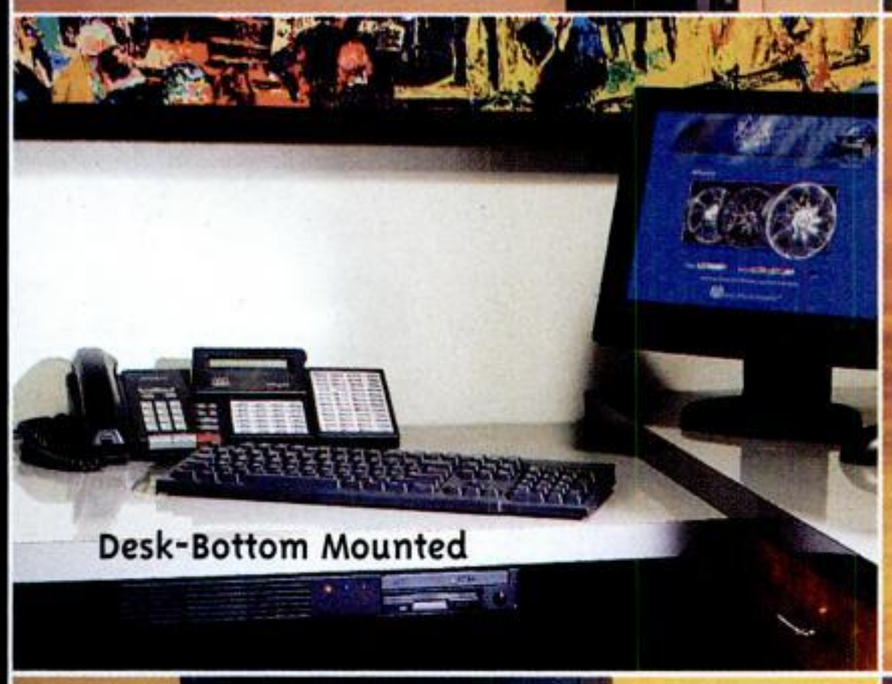
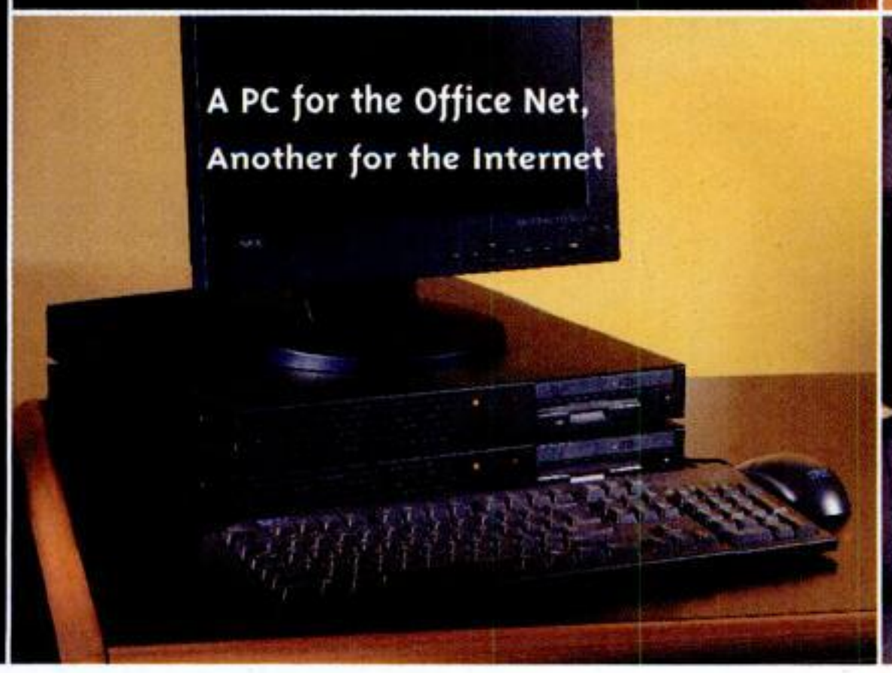
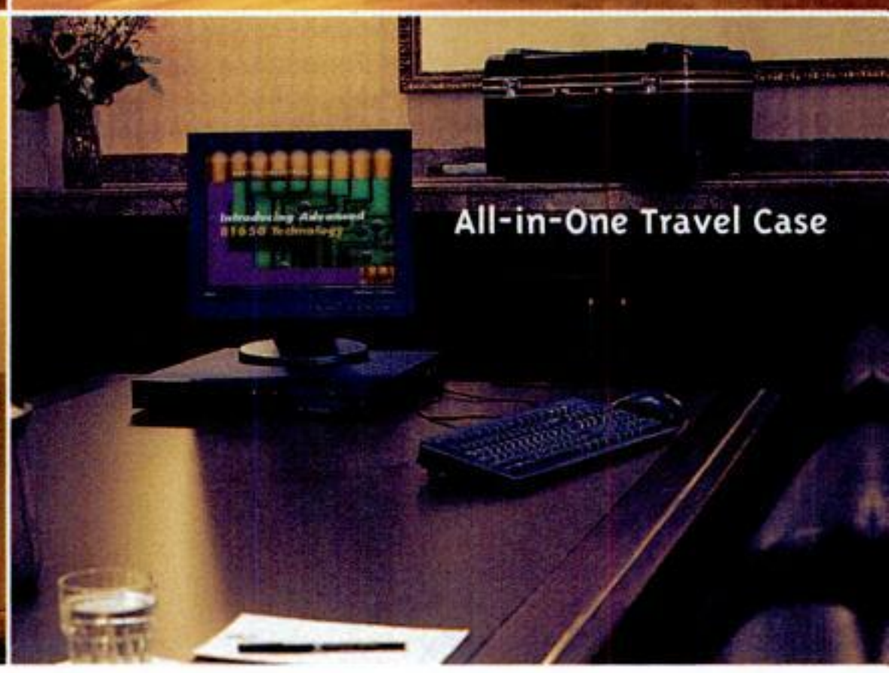
10. Professional 24/7 Support









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Head2Head

A showdown among natural competitors

THIS MONTH: Windows Movie Maker vs. Ulead VideoStudio

With inexpensive DV cameras spreading like wildfire (see page 36), budding Scorseses need cheap, nonlinear editing software more than ever. Sure, everyone knows that Adobe *Premiere 6.0* is the best video editor this side of a G, but for people who would rather spend their next paycheck on a new GeForce4 videocard, Microsoft and Ulead offer *Windows Movie Maker 1.2* and *VideoStudio 6,* respectively. *Movie Maker* is directly integrated into Windows ME and XP operating systems, but the Ulead package costs $100—so what exactly do you get for the money?

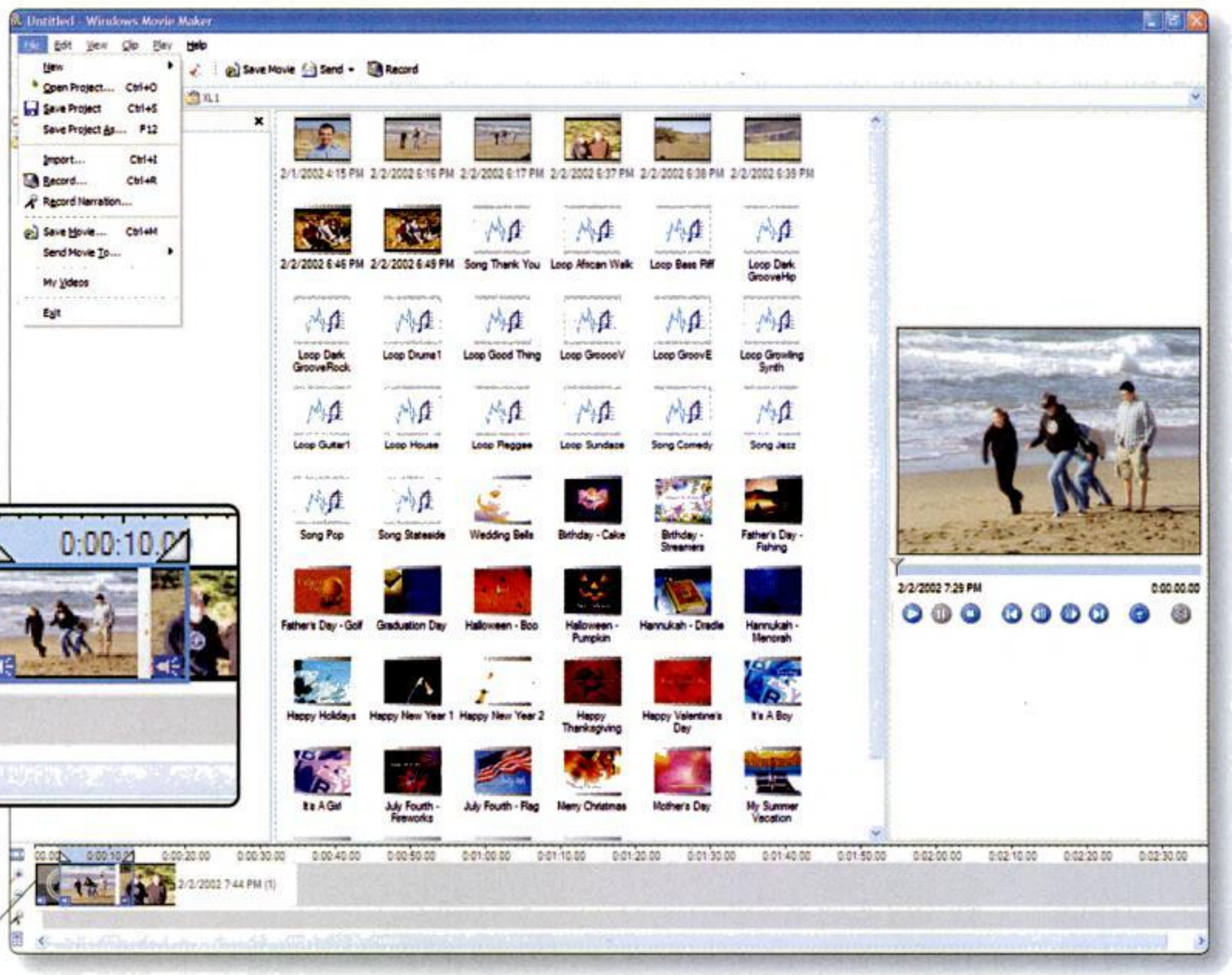
—JOHN TUMMINARO

WINDOWS MOVIE MAKER 1.2

Features: *Movie Maker* definitely runs light in this department. You have tools to effortlessly cut and splice video, but no extended options for transitions, overlays, color correction, titles, and outputting to VCD/DVD. You can capture and perform simple edits, but the more advanced features are beyond this simple program's abilities. **Winner: VideoStudio**

Interface: A clean and efficient interface is critical to the smooth production of any video project—Microsoft clearly understood this when designing *Movie Maker.* Every function is easily identifiable, and eschews all the interface complexity that plagues *VideoStudio.* Simplicity at its finest. **Winner: Movie Maker**

Extras: If you download the free Plus Pack from Microsoft.com, you'll find an assortment of video clips and sound samples that will help you add some flair to your project. Of course, none of these extras even remotely compare to *VideoStudio's* massive library of effects. If you want eye candy, you'll have to shell out the dough. **Winner: VideoStudio**



Timeline: The timeline interface is clean and free of any of the confusing clutter that plagues *VideoStudio.*

Finished results: *Movie Maker* will allow you to capture video from a DV cam or analog source, divide it automatically into clips, add simple transitions and titles, then output it as a Windows Media file or DV AVI. It includes no integrated MPEG encoder, nor any CD/DVD authoring software for creating your own DVD-compatible movies. Bummer. **Winner: VideoStudio**

Price: *Windows Movie Maker* is free with a purchase of Windows ME or XP. To put things into perspective, consider that the $100 demanded by Ulead *VideoStudio* will actually buy you a Windows XP Home Upgrade—which just so happens to contain *Movie Maker,* as well as an operating system thrown in for free. **Winner: Movie Maker**

MAXIMUM PC VERDICT

Movie Maker
MICROSOFT

SEAN CONNERY
Streamlined interface, easy to learn, excellent video capture tools.

GEORGE LAZENBY
Light on features, boasts limited effects, no MPEG encoder, no VCD/DVD authoring.

www.microsoft.com
Free w/Windows ME or XP

6

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ULEAD VIDEOSTUDIO 6

Features: *VideoStudio* is loaded with more effects, filters, titles, audio loops, and sample video than any amateur editor could possibly use in a lifetime. The addition of a built-in VCD/SVCD/DVD creator is fantastic and let us create a DVD-compatible disc using the Pioneer DVR-A03 burner. **Winner: VideoStudio**

Price: A single Benjamin for a midrange video-editing package is by no means excessive, but it's nevertheless $100 more then you would spend on *Movie Maker*. Still, you get what you pay for and *VideoStudio* is significantly more feature-packed than the competition. **Winner: Movie Maker**

SmartRender: *VideoStudio* allows low-quality realtime renders of the timeline with effects.

Finished results: When used properly, *VideoStudio* can net professional-looking results, even on the level of *Premiere,* while its integrated CD/DVD burning software allows easy distribution of your work to people who haven't yet taken the digital plunge. *Movie Maker* can't reproduce even a tenth of the digital wizardry that's available in the *VideoStudio* package. **Winner: VideoStudio**

Interface: VideoStudio's interface uses an eight-step process to streamline all your editing efforts. Sounds good on paper, but Ulead's attempt at simplification ironically turns the interface into a complicated mess of buttons and menu options. It's a shame, really, because *VideoStudio* is packed with powerful features, but proper configuration demands a high degree of patience. **Winner: Movie Maker**

Extras: Besides its more than 100 transitions and 30 effect filters, the software includes a real-time rendering feature that creates low-quality previews on the fly. *VideoStudio* also bypasses the 4GB limitation of the FAT file system—which limits the size of your captures—by automatically breaking up videos into separate files. The package also includes an MPEG/MPEG-2 encoder, though its quality is somewhat suspect; we've seen much better video using the Ligos LSX encoder in Adobe *Premiere*. **Winner: VideoStudio**

MAXIMUMPC VERDICT

VideoStudio 6
ULEAD

JESSICA ALBA
Tons of effects, integrated DVD authoring, powerful tools.

JESSICA TANDY
Brain-dead interface, MPEG encoder quality issues make us wonder....

www.ulead.com
$100

7

THE UPSHOT

The *VideoStudio 6* developers must have said to themselves, "OK, that's great—but how can we add more?" Sure, a lot of the stuff is useful, but no matter how you cut it, *VideoStudio* suffers from an extreme case of bloat and needs to be trimmed. Note to Ulead: Concentrate on improving the interface! You already have plenty of effects. *Movie Maker* is almost the exact opposite of *VideoStudio*—it has a great interface that promotes a smooth workflow, but skimps on effects and output capabilities. Of course, this might be Microsoft's intention; if the free, integrated *Movie Maker* actually competed with the Uleads of the world, the Feds might begin poking their noses ever more furiously in Microsoft's direction.

Bottom line: *Movie Maker* is free and easier to use, but *VideoStudio* provides the best final results, and that's what really matters. Check back next month for a review of Magix *Video Deluxe*, a $50 competitor to Ulead *VideoStudio*. ■

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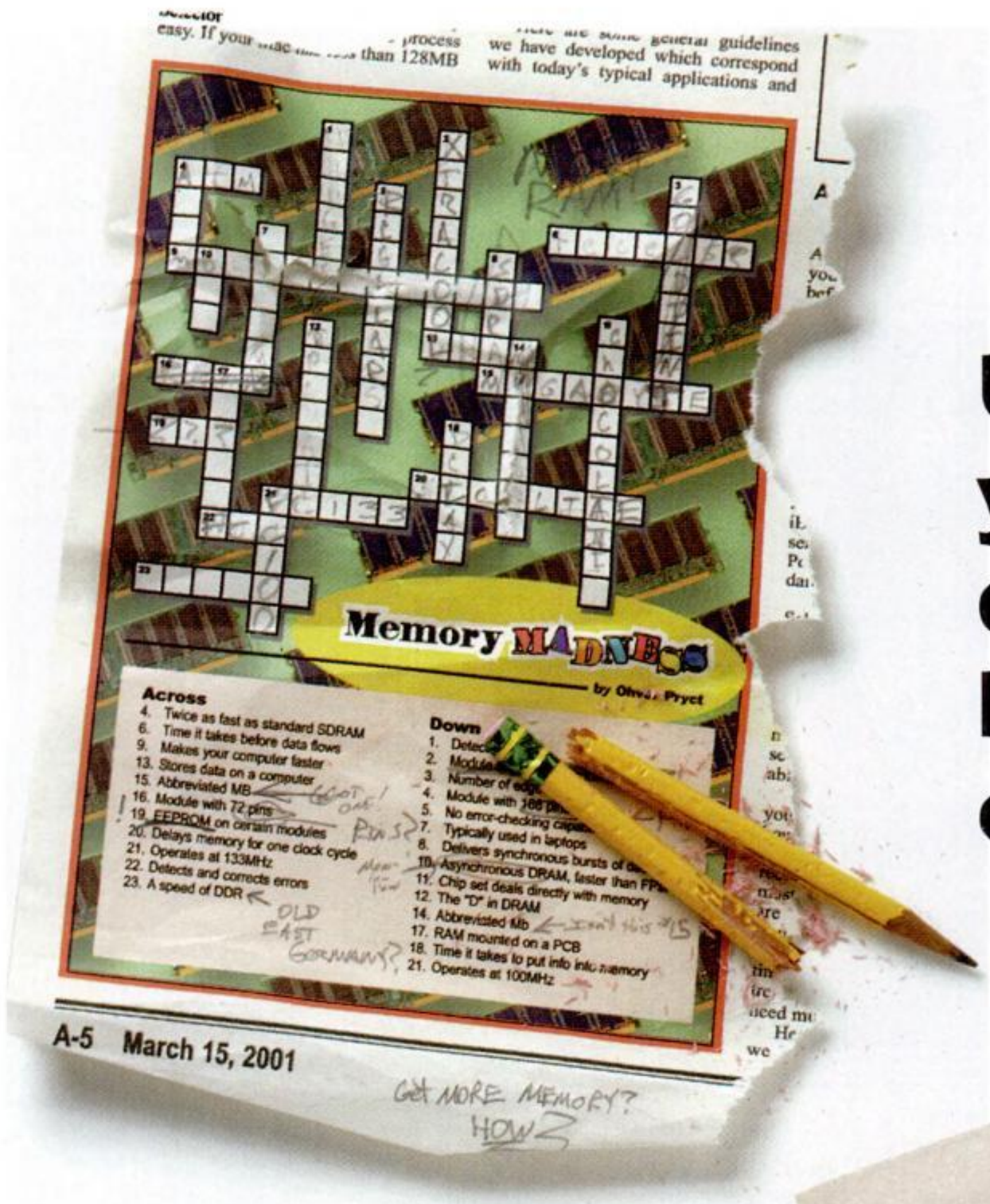
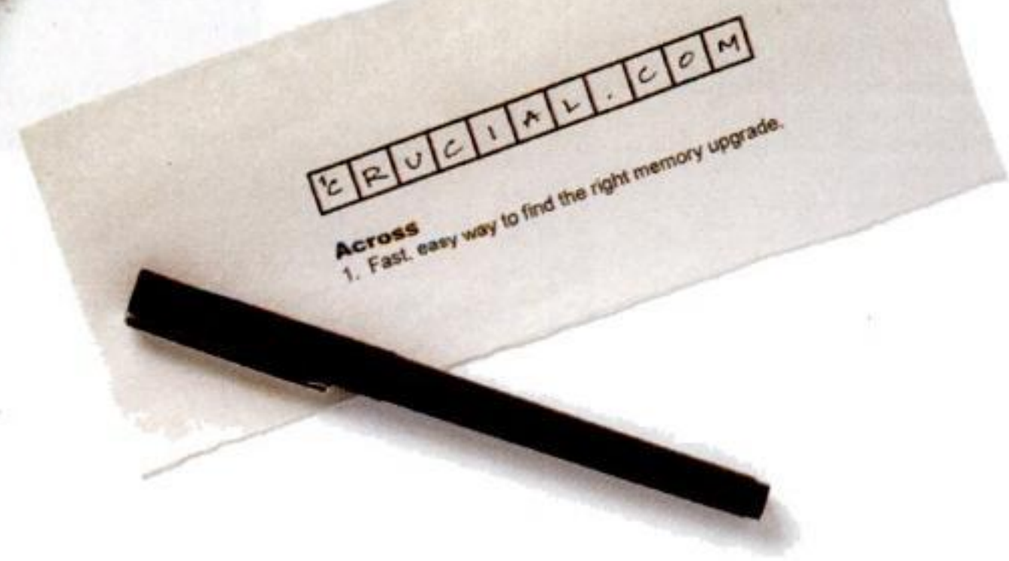

Memory MADNESS
Across
4. Twice as fast as standard SDRAM
6. Time it takes before data flows
9. Makes your computer faster
13. Stores data on a computer
15. Abbreviated MB
16. Module with 72 pins
19. EEPROM on certain modules
20. Delays memory for one clock cycle
21. Operates at 133MHz
22. Detects and corrects errors
23. A speed of DDR
Down
1. Detec
2. Module
3. Number of edge
4. Module with 168 pin
5. No error-checking capabi
7. Typically used in laptops
8. Delivers synchronous bursts of da
10. Asynchronous DRAM, faster than FP
11. Chip set deals directly with memory
12. The "D" in DRAM
14. Abbreviated Mb
17. RAM mounted on a PCB
18. Time it takes to put info into memory
21. Operates at 100MHz
A-5 March 15, 2001
GET MORE MEMORY?
HOW?



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WatchDog

Say hello to Diamond, WatchDog of the Month.

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

- > BestBuy.com
- > IBM Deskstars
- > Microsoft
- > Pinnacle

IBM Deskstar Update

A class-action suit that alleges IBM's hard drives were falsely advertised as "reliable" should be dismissed, attorneys defending IBM say. IBM's attorneys moved to have the court dismiss the case on several technicalities. The attorneys say that none of IBM's actions amounted to false advertising or fell below the level of "puffery" that's traditionally allowed by courts. The attorneys from the firm Quinn, Emanuel, Urquhart, Oliver & Hedges of Los Angeles also say that suits based on a manufacturer's claims of general product reliability and superiority are not actionable. The original suit, filed by Sheller, Ludwig & Badey of Philadelphia, mainly accused IBM of false advertising and alleged that the 75GXP-series hard drives failed at rates higher than normal. Attorneys for IBM and those suing the company were not available for comment.

Sheller, Ludwig & Badey originally filed suit on behalf of *Maximum PC* reader Michael T. Granito who had several IBM hard drives fail. The suit has since added an additional nine plaintiffs. All plaintiffs allege that the 75GXP is flawed by a design defect and that IBM falsely advertised the drives as reliable when they were, in fact, not. Consumers can find both the original complaint and the motion by IBM's attorneys at www.sheller.com/ibmclassaction.htm. Consumers who are irked by the drives may also sign up for updates at the web site.

Complaints about failed 75GXP Deskstars continue to dribble in to The Dog: "Yo, Dog, I just want to chime in on the IBM Deskstar 75XGP mess. I work for a mid-size hosting company/ISP. In the last 12 months, of the 100 or so IBM 75GXP hard drives we purchased (from different vendors, no less) we've had 40 (and still counting) hard drives fail. I take issue with IBM's assertion that the popularity of the drive has resulted in a greater number of reported failures. Hogwash! Unless of course, IBM thinks that a 40 percent failure rate is acceptable," says a reader by the name of Gavster.

Although in the minority, a few readers say they've had no problems. Hung Tran, for instance, says, "I personally have four 60GB GXP models and one 75GB model, and none have experienced problems. I've done a lot of WinRaR on those five drives without incident in more than a year of use."

Make That CrazyAssBestBuy.com

DEAR DOG: I pre-ordered a GeForce4 Ti 4600 card from BestBuy.com because it was priced at $129.99. Later that day, I checked to make sure the order was OK, and it was cancelled. I then called BestBuy.com and was told my order was cancelled because the price was a mistake. The store said it cancelled everyone else's order as well. I was under the impression that the law says retailers must honor advertised prices. I have a printed copy of both my order confirmation and the display page advertising the card for that price.

— ADAM DENLEY

THE DOG RESPONDS: Numerous other readers and perhaps as many as 1,800 people total rushed to buy the new nVidia card at BestBuy.com's crazy-low price, according to news reports. When contacted about the error, a BestBuy.com spokeswoman confirmed that it was indeed an error and not insane-in-the-membrane pricing. The spokeswoman said BestBuy.com corrected the price once it learned about it, but the company has no plans to sell any boards at the mistakenly advertised price. She directed The Dog to BestBuy.com's policy on errors, posted on the front page under Policies, then Quantity Limits, Errors and Omissions: "We reserve the right to limit quantities ordered. Errors or omissions in descriptive, typographic, pricing and/or photographic representation are subject to correction. We reserve the right to modify this site's content at any time."

Several readers reported that their credit cards were immediately charged even though the card was a pre-order item and would not be available for almost a month. According to the spokeswoman, BestBuy.com does not actually charge cards until the product is shipped. Many people may have mistaken charges for the authorization hold that merchants place on credit cards to ensure a consumer has the available credit. The authorization holds normally disappear after a week.

The spokeswoman apologized for the error and said the company plans to make up for the goof by offering those who ordered the cards a $30 credit toward any purchase at the web store. Although many say BestBuy.com's offer of a credit is a good first step, the best step, they say, would be to offer the card at its originally listed price. Others are calling for a class-action suit against the company.

Do consumers have an 'actionable' item? The Dog has been advised by some attorneys that advertisements generally do not amount to legal contracts. But California attorney Gary Sodikoff disagrees. Sodikoff filed a class-action suit against web store Buy.com in February of 1999 when Buy.com listed a 19-inch Hitachi monitor for $164. The monitor normally sold for nearly $600. Buy.com eventually settled the case out of court for more than half a million dollars.

"I then called BestBuy.com and was told that my order was cancelled because the price was a mistake."

"The law in California is fuzzy. When there is a unilateral mistake and there is knowledge on the part of the buyer, the buyer can't take

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

ed material

COMING NEXT MONTH

IN THE MAY ISSUE OF MAXIMUM PC

Busting Bottlenecks!

Vote off the weakest link in your PC with our guide to the pernicious bottlenecks that may be strangling your system's performance. We'll take you on a tour of the usual bottleneck suspects, identifying classic misconfigurations, pokey components, and aging technologies that could be costing you precious time, performance, and frames per second.

Photo Printer Roundup

From your camera to your PC, then to your printer—your digital camera's prayers have been answered. Today's photo printers not only cut out the photo lab middleman, but they can also deliver prints that are nearly indistinguishable from their celluloid counterparts. Check out our roundup of the world's smallest digital darkrooms.

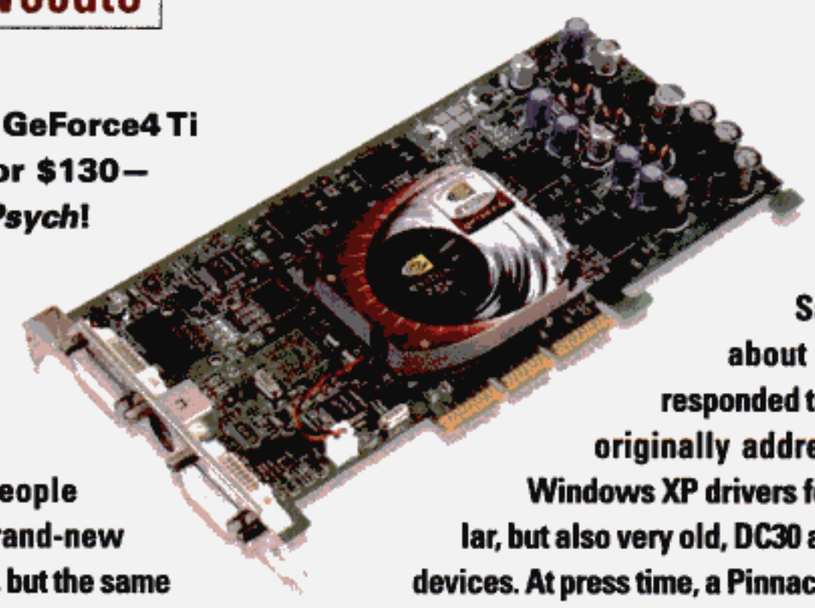
The (Battery) Power Guide

A "voltaic pile" sounds like a disease you definitely don't want, but today we couldn't live without what we now know as batteries. They juice up our laptops, PDAs, cellphones, MP3 players, digital cameras and everything else we take on the road. Maximum PC looks at the unsung heroes of the real wireless revolution.

20 Burning Questions to Ask Your DSL Provider

So long, sucka! That's what you're likely to hear from your DSL provider if you don't ask the right questions before you sign up. Here's a laundry list of questions that could prevent you from holding the business-end of a dropped connection.

Consumer Advocate



Buy this GeForce4 Ti 4600 for $130—*Psych*!

advantage of the mistake," says Sodikoff.

In general, most people would know that a brand-new car can't sell for $1,500, but the same reasoning doesn't necessarily apply to computer equipment, where items that sold for $1,000 one year, sell for $100 the next. Sodikoff says that what constitutes a contract is also up to interpretation.

"These people pledged their credit, the other side accepted that pledge. If I advertise something and a guy lays down money (or something like money), doesn't that seal the bargain?," asks Sodikoff.

Where the suit would be filed and which state's laws were allegedly violated is also a question. Is it filed where the customer lives or where the company is located? Immediate parallels can't be drawn between the Buy.com and BestBuy.com incidents, but Sodikoff says consumers shouldn't immediately assume they have no case. Woof.

DC30 Blues

DEAR DOG: I'm writing to vent about the lack of XP drivers for Pinnacle's popular DC30 capture card. I've checked out the Pinnacle forum and queried Pinnacle's support, and the response is always that Windows XP drivers will not be made for the DC30 Pro. What's sad is that this card is still being sold in stores today. Not only that, but when the card was first developed, it was made for Windows 95. Then Pinnacle went to such great lengths to finally port this card over to Windows 2000, an NT kernel. That's a major step, and moving from Windows 2000 to Windows XP is not as big a jump as going from Windows 95 to Windows 2000.

I am not the only person with this card; there are actually quite a few who frequently post on the Pinnacle forums, begging for an XP driver. Many users purchased this card new ($500) just a few months ago. Seeing that there were Windows 2000 drivers at the time, most people would assume that Windows XP support would follow. Wrong!

Pinnacle will not provide the source code so someone else could at least try to fix the problem. They have not even offered an upgrade promotion for DC30 users. Pinnacle will not budge!

— SAM

THE DOG RESPONDS: Sam was one of about 30 people who responded to The Dog's column originally addressing the lack of Windows XP drivers for Pinnacle's popular, but also very old, DC30 and other hardware devices. At press time, a Pinnacle Systems spokeswoman said the company has decided to offer an upgrade option to DC30 users. DC30 owners may buy the DV500 at a discount of $300 (the board normally sells for $600 or more). The upgrade, however, will not ship with Adobe *Premiere*, but DC30 owners should already have the app. The spokeswoman said the company is also investigating the possibility of releasing XP drivers for the DC30.

On the other hand, some readers are quite satisfied with Pinnacle. According to Doug Hardy: "I purchased Pinnacle's *Studio DV* product about a year ago and installed it on my PC. I recently replaced my system and wanted to use the product on the new PC. I had some issues with it, but after some help from Pinnacle's tech support, I had a brand-new CD with the latest version of *Studio DV*, which installed and ran flawlessly. Given that most letters only complain about poor service, I wanted to point out Pinnacle's first-rate service in getting its product back up and running." Woof.

Pinnacle is Not Alone

DEAR DOG: I own the now-classic Microsoft Sidewinder Gamepad. (Gameport edition, not USB). I just received a new computer loaded with WinXP. Installing this piece of hardware was a breeze (though it did not autodetect), but I had problems installing the Activator that configures my Sidewinder to perform macro functions. After visiting Microsoft's hardware web site, **(www.microsoft.com/hardware)** I discovered that Microsoft has no plans to update its own software for gameport controllers under XP.

It is just awful that Microsoft would make a product that is not compatible with its new flagship OS. Trying to reach support for this has gotten me nowhere.

— EDWIN MELLIZA

"It is just awful that Microsoft would make a product that is not compatible with its new flagship OS."

THE DOG RESPONDS: Ed, The Dog agrees. What has the world come to when even Microsoft can't support Microsoft products? The Dog tried to contact a Microsoft spokesperson to find out why the company isn't supporting its own hardware, but the only sound at press time was of one hand clapping. ■

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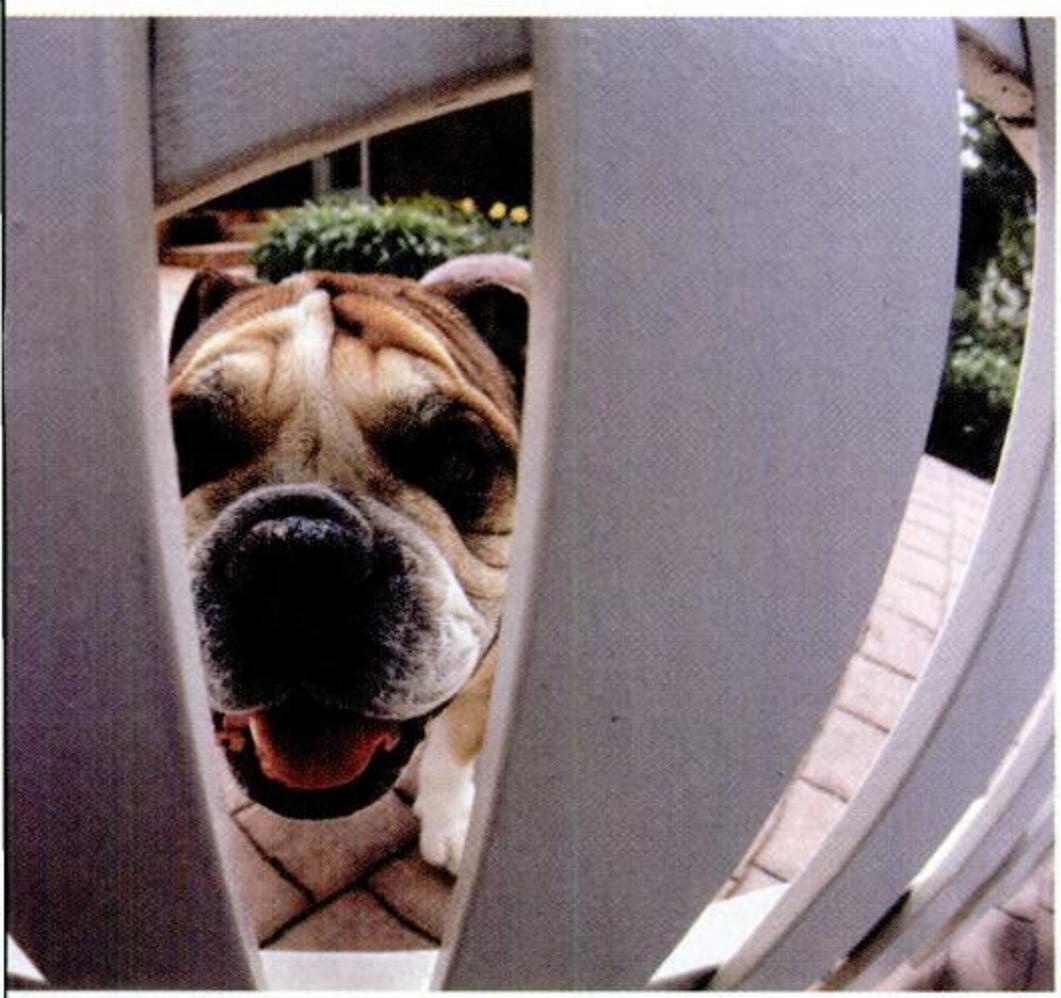

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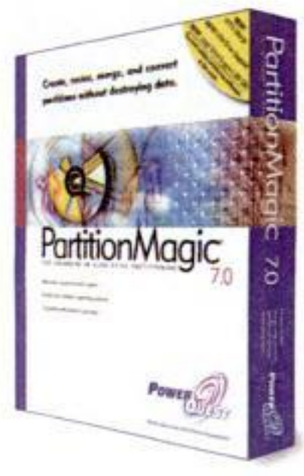

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GeForce THE NEXT GENERATION

nVidia's powerful new 3D accelerator pushes PCs past the Xbox and into polygon paradise!

KEY SPECS
(for the Ti 4600)

CORE SPEED 300MHz
MEMORY SPEED 325MHz
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PROCESS SIZE 0.15-micron
MEMORY DDR SDRAM in a ball-grid array package

KEY FEATURES

- Extra Vertex Shader
- Crazy Memory Optimizations
- Anti-aliasing that WORKS
- Multiple Monitor support

BY WILL SMITH

But we're still asking: Where are the games?

Say hello to the latest, greatest, biggest, baddest 3D accelerator ever. Code-named NV25, the GeForce4 picks up where nVidia's GeForce3 left off, and pretty much lays to waste all the videocard and console-gaming competition. We're talking more than 60 million transistors, two programmable vertex pipelines, and a 10GB/sec memory pipeline. That's right—*gigabytes* per second. Although the GeForce4 is essentially a supertuned, steroidal version of the GeForce3 (the technology used inside the Xbox), it has the potential to match the impact of most revolutionary 3D chips of the past.

To truly understand the GeForce4's significance, you have to consider how far 3D gaming accelerators have advanced during the past seven years. In 1995, a tiny, unknown company named 3dfx released the Voodoo Graphics chipset, a PCI-based juggernaut designed to do one thing and one thing only: render and texture polygons. When paired with *GLQuake,* its killer app, a Voodoo card introduced gamers to fully three-dimensional gaming environments, rendered in realtime at the then-massive resolution of 640x480, all in glorious 8-bit color.

GLQuake included fancy effects, such as transparent water and reflections, that only a dedicated 3D accelerator made possible. The Voodoo and its descendants, however, were highly specialized insomuch that a 3D game had to send polygon and texture information to the chipset in very specific formats. This limited game developers to using only features—such as texture combines and specific types of bump maps—that were directly coded into the chip's circuitry. If a developer wanted to create his own custom effects, he was essentially out of luck. That is, until about a year ago when nVidia launched the GeForce3.

The GeForce3 was the first 3D accelerator to include a programmable GPU, or graphics processing unit. The ATI Radeon 8500, released a few months later, added another player to the programmable GPU party. A programmable GPU is similar to a CPU in that it's hardwired with a small number of basic commands that can be executed very quickly—for example, blending the values of two pixels, or changing the position of a vertex in 3D space. Developers can string those commands together into long sequences that perform much more complex actions than what was capable with the non-programmable accelerators of the past. The

Continued on page 26

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Continued from page 24

new programmable GPU represented a completely new way of doing things for the 3D programmer and, consequently, a bold new world of more lush, detailed, and realistic visuals for the 3D gamer.

Toy Story–caliber graphics, here we come.

So what's the difference between the GeForce4, the GeForce3, and the Radeon 8500? Should GeForce3 owners upgrade? And what the hell is a "GeForce" anyway? Follow along as we explore... GeForce: The Next Generation!

NRedefining "hardcore"

The heart of the GeForce4 is the NV25 chip, which has 63 million transistors on a 0.15-micron process. That's six million more transistors than are in the GeForce3 core, and eight million more than are in the latest Pentium 4! The new core also adds a second vertex shader—besting the GeForce3 to the tune of precisely one extra shader.

But the fun doesn't end there. The NV25 also sports an optimized memory controller that uses some devilish new tricks to juice even more performance out of its accompanying DDR memory. In fact, regardless of whether the new memory controller is paired with 325MHz DDR (the fastest memory implementation in the new GeForce4 family) or 250MHz DDR (the slowest GeForce4 memory implementation, and the same speed you'll find on a GeForce3Ti 500), you'll still get more bandwidth out of your RAM, which has become the bottleneck for modern 3D accelerators today.

The folks at nVidia also implemented multi-monitor support across the entire lineup of GeForce4 products. That's right: Now every manufacturer has the option to include multiple-monitor support should they so desire.

Changing the shader core

The pixel and vertex shaders in the GeForce3 and GeForce4 are what put the "programmable" in programmable GPUs. In experienced hands, they provide an unprecedented amount of freedom for programmers to improve graphic quality without sacrificing frame rate performance.

Pixel shaders, for example, make it possible to bump-map almost every surface within a game. In fact, programmable pixel shaders allow a developer to manipulate every single pixel—that pixel can be transparent, reflective, or none of the above. In case you're not hip to 3D development terminology, bump-mapping is a technique that imbues a flat surface with the appearance of depth and texture, all without adding to the polygonal complexity of the scene. For example, the pockmarks from a grenade explosion can be rendered via bump-mapping.

It's now possible to take a model with 300,000-plus polygons and use a special filter to convert that super-complex model into a lower-poly model that bears highly detailed bump-maps. This provides much more detail than would otherwise be possible in a realtime game environment. More advanced bump-maps can even be used to create effects like true reflections and refractions of light.

In respect to the GeForce4, the only thing really new about nVidia's pixel shaders is the inclusion of "Z-correct bump-mapping." Previously, when two bump-maps converged, or another object interacted with a bump-

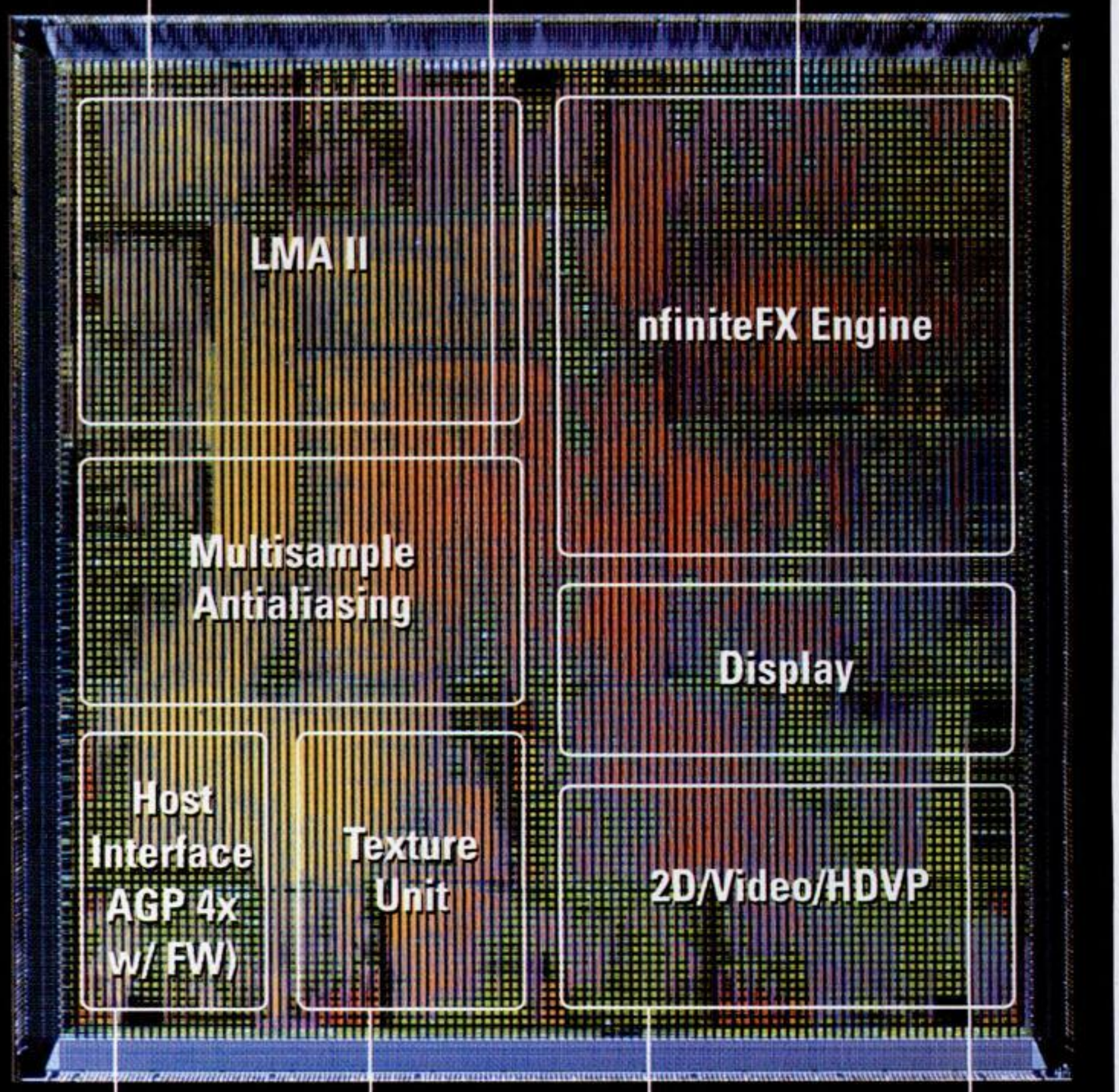
Inside the GeForce4

Here's an in-your-face look at the GeForce4 Ti die. Though it's magnified a bunch of times, you still can't see all 63 million transistors. But who's counting?

LMA II The GeForce4's memory controller—dubbed Lightspeed Memory Architecture II—directs traffic from this location and allows the GeForce4 to take full advantage of its 325MHz memory.

Multisample anti-aliasing Anti-aliasing is finally practicable on the GeForce4, thanks to this highly optimized AA engine.

nfiniteFX engine Two vertex shaders and one pixel shader reside here, giving the GeForce4 its programmable power.



Host interface Everything the GeForce4 requires to talk to the AGP bus resides in this section of the chip.

Texture unit To texture legacy games (as well as surfaces in programmable-shader games that don't use pixel shaders) the GeForce4 includes legacy texture pipelines.

2D/video/HDVP The GeForce4's hardware motion compensation, HD video processor, and other transistors dedicated to 2D reside here.

Display The GeForce4's on-chip DACs and TDMS transmitters for CRTs and flat panels are situated here. By placing these functions directly on the GPU die, manufacturers can save money, not to mention circuit-board real estate.

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The Wolfman demo from nVidia sports 300,000 polygons, realtime rendered fur with per-pixel anisotropic lighting, and a skeletal animation system. The Wolfman even casts shadows upon himself!

map, the results were unpredictable and frequently didn't look right. Even though the bump-maps gave the appearance of depth, there was no real depth information for the bump-map, so other objects would appear to sink slightly into the texture when they came close. This would be especially apparent when bump-maps intersected with water. But these problems aren't present in the GeForce4, thanks to Z-correct bump-mapping, which assigns depth values to bump-maps and thus prevents clipping errors.

Vertex shaders are the other half of the programmable-shader equation—and this is where nVidia got busy. Vertex shaders allow game developers to manipulate model vertices in ways that just weren't possible with the traditional, static 3D pipeline. While the most visually stunning use of the vertex shader is in the rendering and animation of hyper-realistic fur and hair, they can also be used to render breathtaking vistas of grass and smoke, and even execute model morphing and distortion.

The GeForce3 and ATI Radeon 8500 are both capable of delivering these effects to you, so what's so special about GeForce4? Simple: The GeForce4 includes a second programmable vertex shader, which should double vertex throughput on games that use DirectX 8.1. The additional vertex shader allows scenes of truly staggering complexity to be rendered in realtime. For example, the Wolfman demo that nVidia produced contains *300,000* polygons (see the screenshot on this page). More vertex processing power lets designers render more hair and fur, just like they've always wanted to. (We're not kidding around here, folks. The lack of legitimate hair and fur effects have been major roadblocks to 3D realism. Developers have always wanted to implement hirsute hijinks, and you'll know why when you see the Wolfman demo.)

Bottom line: From a programmable-shader front, upgrading from a GeForce3 to a GeForce4 is analogous to upgrading from a Pentium II to a Pentium III. You get more speed, a more efficient design, a few new features, and a spiffy new package.

New secret memory sauce!

The GeForce3 introduced the world to Lightspeed Memory Architecture, nVidia's fancy-lad term for its memory-optimization routines. Because GPU speeds now dramatically outpace memory speeds, memory effectively bottlenecks a GPU in modern videocards. So, as one might surmise, making better use of available memory bandwidth gave the GeForce3 a significant boost over GeForce2-class videocards.

The most important feature of Lightspeed Memory Architecture is its "crossbar memory controller." Instead of a single memory controller accessing small bits of data from memory in oversized chunks—a process that wastes significant amounts of memory bandwidth—the crossbar controller uses four independent memory controllers, each of which can access a videocard's memory in much more efficient, smaller chunks. This increases the overall efficiency of a card's memory pipeline. Indeed, when the GeForce3 rode into town, its memory

Anatomy of the ball-grid array

After you've gotten over the shock of seeing the GeForce4's funky new cooling apparatus, the next thing you'll probably notice is that the 325MHz DDR SDRAM on the circuit board sports a new packaging design (in other words, its electrical connections are attached to the board in a different manner). The old TSOP (thin, small outline package) memory has been replaced by a new, improved ball-grid array package.

Why use a BGA package? Well, for starters, using a ball-grid array lets board manufacturers run their memory at higher speeds with fewer errors. For this, you can thank the connection between the solder balls and the sockets, which is much more precise than the connection offered by the old TSOP design.

Solder balls are the key to the ball-grid array. Replacing dozens of fragile leads, these balls nestle into recesses in the socket, basically creating a perfect connection that's more difficult to interrupt.

The new BGA package is put to use on these superfast, 166MHz DDR SDRAM modules. Note that there are no visible leads on the BGA modules.

This SDRAM is connected to the memory module using the old TSOP design. Each lead is individually soldered to the board, creating dozens of possible failure points.

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What do game developers think about the GeForce4?

Here's what Tim Sweeney and John Carmack have to say

As the lead programmer for Epic Games, Tim Sweeney wrote the graphics engines for *Unreal* and *Unreal Tournament* and is currently working on *Unreal 2*. Here are his thoughts about the different GeForce4 boards.

On the GeForce4 Ti: "The GeForce4 Ti cards have awesome, industry-leading performance and features. We're totally thrilled with them. The GeForce4 Ti, like the ATI Radeon 8500, will be a great card for all the new games that will come out in 2002 and beyond. I can wholeheartedly recommend either of these cards for gamers."

On the GeForce4 MX: "The GeForce4 MX cards have reasonably good performance for their price, but their naming is unfortunate and shortsighted. They are not real GeForce4s. They would be better called something like 'Super GeForce2 MX' cards, because they have the legacy DirectX 7 feature set with hardware T&L, but no pixel shaders or vertex shaders, and they can render only two simultaneous textures instead of four.

"The GeForce4 MX cards are fine for older games like *Unreal Tournament* and *Quake III*, but will be left in the dust—both in terms of performance and features—by next-generation games like *Unreal 2* and *DooM 3*."

John Carmack is the lead programmer at id Software. He's coded the graphics engines for every id first-person-shooter, from *Wolfenstein-3D to Quake III: Arena*. He's currently working on id's next project, a follow-up to the classic *DooM*. Here are Carmack's comments on the current state of 3D, pulled from his .plan file update of February 11, 2002.

On nVidia's drivers: "nVidia's OpenGL drivers are my 'gold standard,' and it has been quite a while since I have had to report a problem to them, and even their brand-new extensions work as documented the first time I try them. When I have a problem on an nVidia card, I assume it's my fault. With anyone else's drivers, I assume it's their fault."

On the GeForce4 MX: "Do not buy a GeForce4-MX for *DooM*. nVidia has really made a mess of the naming conventions here. I always thought it was bad enough that GF2 was just a speed-bumped GF1, while GF3 had significant architectural improvements over GF2. I expected GF4 to be the speed-bumped GF3, but calling the NV17 GF4-MX really sucks.

"GF4-MX will still run *DooM* properly, but it will be using the NV10 codepath with only two texture units and no vertex shaders. A GF3 or 8500 will be much better performers. The GF4-MX may still be the card of choice for many people depending on pricing, especially considering that many games won't use four textures and vertex programs, but damn, I wish they had named it something else."

The nVidia squid demo shows realtime reflections and refractions. The seaweed on the bed is animated with a vertex-shader program and is displaced by using a real-physics fluid dynamics model, which runs on the CPU.

performance gains were immediately apparent.

The GeForce4 introduces Lightspeed Memory Architecture II and adds several enhancements to the existing crossbar technology. By compressing Z-buffer data, drawing only those pixels that will eventually be shown, and optimizing the way data is written to and read from the actual memory banks, nVidia's engineers were able to significantly reduce the amount of traffic over the memory bus.

Here's how they did it:

■ Z-buffer compression: To describe the position of an object in a 3D space, a game developer uses three numbers, each corresponding to the object's position on the horizontal, vertical, and depth axes (commonly called the X, Y, and Z axes). Information about the *depth* of an object—the Z axis—is stored in a videocard's Z-buffer. In a 3D game, there's typically more frequent movement in the Z-axis than in the other two axes. This movement creates traffic between the GPU and the video memory. By losslessly compressing the Z-buffer data—that is, using a compression algorithm that does *not* result in data loss—the GeForce4 is able to free up precious memory bandwidth. Of course, the best news of all is that the Z-buffer compression algorithms are built directly into the GeForce4 GPU, so the process doesn't eat up valuable CPU cycles.

■ What you see is what you get: In a traditional 3D accelerator, a scene is rendered from back to front, starting with the object furthest away from your personal point of view (the PowerVR chip's tile-based renderer is a notable exception; it doesn't render objects that aren't visible). If a wall ends up blocking a player model, all 3,000 polygons of that player model are still drawn and textured, which eats memory bandwidth with absolutely no benefit to the gamer. But the GeForce4 bucks tradition by incorporating a form of hidden surface removal called occlusion culling to keep obscured objects from being drawn. Occlusion culling essentially checks the Z-buffer to determine an object's depth in the scene. If another object is determined to be in front of it, then the occluded object isn't rendered at all. This way, only the polygons that will eventually appear onscreen are drawn and lit. In highly complex scenes, occlusion culling can boost memory performance anywhere from 50 to 100 percent!

■ Memory on tap: Finally, nVidia made improvements to the most basic SDRAM technology. SDRAM is broken down into many banks of memory. Previously, when the GPU needed to read from or write to a bank of memory, the memory had to be pre-charged by the memory controller before it was ready for access. The pre-charging process required about 10 memory clock cycles before the memory bank was ready to accept data. The pre-charge penalty frequently kept data from moving from memory to the GPU, which caused the GPU to sit idle while waiting for data—a worst-case scenario. The GeForce4 ameliorates this problem by pre-charging memory banks that aren't currently being used, but are likely to be used in the near future. That means that when the GPU does try to access the memory, it doesn't need to wait for the memory to "warm up." Instead,

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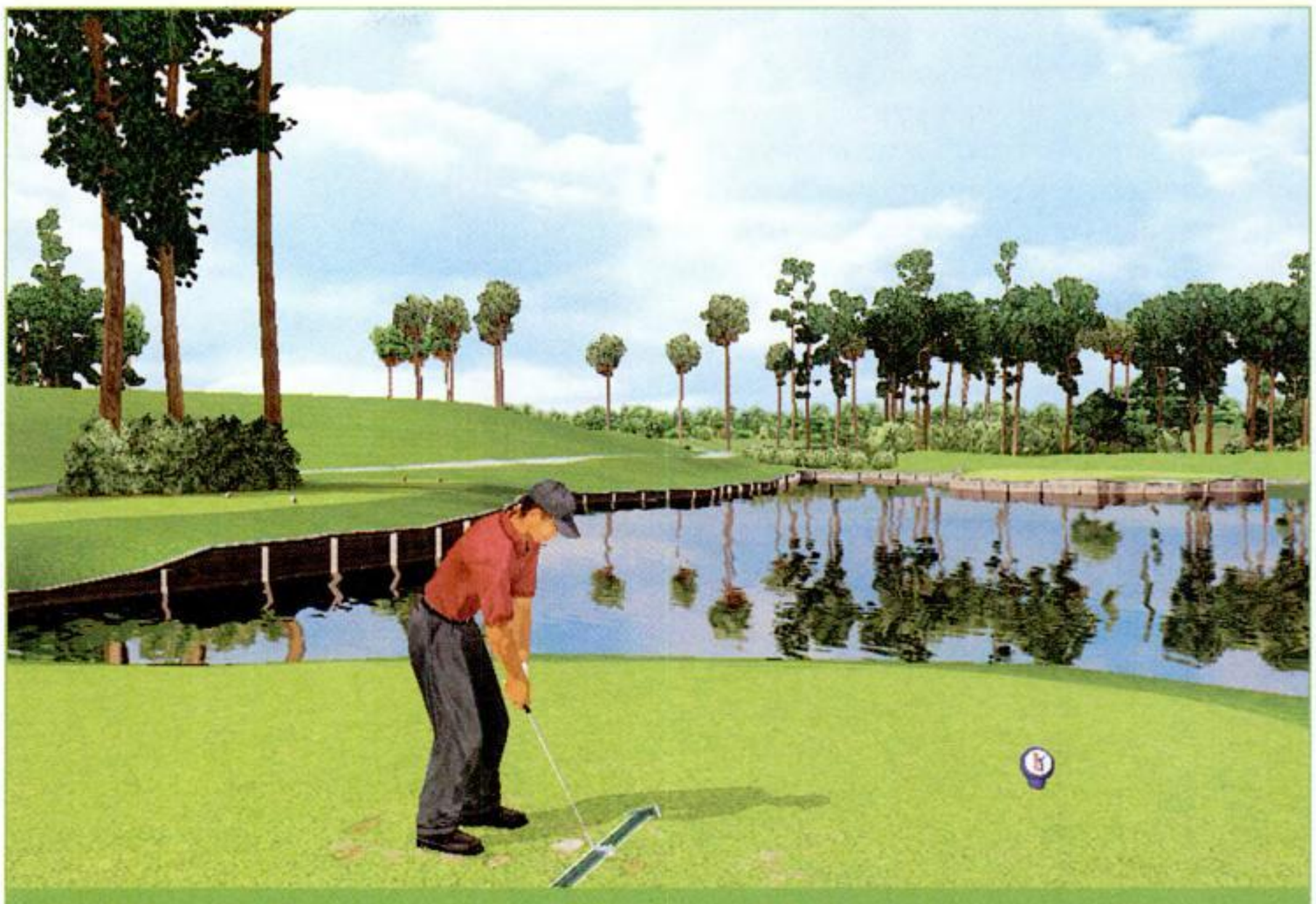
it just merrily grabs the data it needs and moves on to the next bank.

Another behind-the-scenes tweak is the introduction of fast Z-buffer clearing. In order to minimize "depth artifacts"—for example, an object poking through a wall when it shouldn't be—data stored in the Z-buffer has to be absolutely accurate. To ensure accuracy, the Z-buffer has to be cleared by writing zeros to the appropriate areas of memory. This takes GPU processing time and memory bandwidth. The fast Z-buffer clearing technology in the GeForce4 can theoretically save up to 400MB/sec of the card's 10.4GB/sec theoretical memory bandwidth.

The best part about all these memory enhancements is that they're not limited to games that use the GeForce4's programmable shaders. By optimizing the memory pipeline, *all* games that had been strangled by slow memory speed should show a frame-rate gain. In games that were never hampered by the memory bottleneck, Lightspeed Memory Architecture II frees enough bandwidth so that memory-intensive features, such as full-scene anti-aliasing, can be enabled with no real performance hit.



EA's *Tiger Woods 2002* uses a programmable pixel shader to deliver true reflections and ripples on the water at Sawgrass 17 and other less imposing water hazards. Firing one into the water isn't so bad when you see accurately modeled ripples.

But can we actually use anti-aliasing?

We've been hearing about the benefits of full-scene anti-aliasing since 3dfx pimped its "T-buffer" technology in 1999. Anti-aliasing (AA) fights "jaggies," those horrible little jagged edges that form on the edges of objects in high-detail scenes. As 3D accelerators get more powerful and render more complex scenes, AA becomes ever-more necessary because jaggies will create unsightly shimmering effects on objects with many parallel lines, such as manes of long hair or large fields of grass.

Basic anti-aliasing is done by generating additional information for the pixels on the screen to minimize errors in the final render. Several different techniques have been developed to do this. The easiest technique is called super-sampling. Super-sampling simply renders a much higher resolution image than is actually needed, then scales it down to the desired resolution, then filters it. This is also where the naming conventions for different AA modes arose. For example, 2x FSAA blends two samples per pixel, while 4x blends four samples. The end result is that each pixel that's displayed onscreen is the result of a combination of two or more other pixels. Unfortunately, this technique is highly GPU-intensive and eats *tons* of memory bandwidth. Previous technologies that attempted efficient anti-aliasing—such as nVidia's Quincunx mode, which provides near–4x quality AA via a two-

Good-Googa-Maloo!

So what the heck does 'GeForce' mean?

Ever wonder what a "GeForce" is? You're not alone. We couldn't help but wonder what the term might have meant before nVidia usurped it for its first 3D accelerator with a transform-and-lighting engine. We dug around in Webster's New World College Dictionary, but between "gefiltefish" and "gegenschein" we found no mention of the word GeForce. We did, however, find out that a ge is "a family of South American Indian languages of Brazil, many now extinct" and force means "strength, energy, vigor, power." From this we can surmise that GeForce means a powerful yet extinct family of South American languages.

Unsatisfied with this conclusion, we also consulted with the sage members of the *Maximum PC* online forums. Here's what they thought:

PUNKY01 "In physics, GeForce is defined as the gravitational pull on my bank account that occurs twice a year."

ALEX911 "GeForce is what happens when one company's idea turns into a nuclear arms race of 3D performance."

RAVEN457 "Geforce = R.I.P. 3dfx"

XSPAMARCHY "GeForce means your bank balance will be low while your polygon count and frame rates will be high. Savage3D is the other way around."

MUHATMA_KHAN "There was a god that pulled me from mediocrity and led me to beautiful visions. That god's name was GeForce."

DEATHBIOSX51 "Meesa think Geforce is way powerful."

While these were all compelling and reasonable interpretations, we decided to go to the source. The official word from nVidia? Brian Burke, senior P.R. manager, tells us that, "GeForce originally stood for 'Geometry Force' since it was the first GPU for PCs to calculate the transform-and-lighting geometry, offloading that function from the CPU."

While this does settle the issue somewhat, we're still wondering what the chip has to do with extinct South American languages.

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sample technique—resulted in nice-looking AA, but unplayable frame rates.

A different anti-aliasing strategy involves multi-sampling. Instead of rendering an entire higher-resolution image in the manner described above, a multi-sampling system renders an image at its normal resolution, along with extra "virtual" pixels that are used to smooth out the jagged edges of the base image. This strategy requires much less precious memory bandwidth and provides results that are virtually indistinguishable from the much more intensive super-sampling technique.

All of this leads us to Accuview, the GeForce4's anti-aliasing system, which uses a sophisticated multi-sampling technique. The GeForce4 can actually render the extra virtual pixels without any performance hit at all because its anti-aliasing subsystem is outfitted with wider internal data paths that were expressly designed to accommodate additional texture information.

But the real innovation in Accuview is its jittery sampling pattern. Instead of sampling virtual pixels in exactly the same spots, the GeForce4 samples them in semi-random spots that continually change. This produces a more mathematically correct anti-aliasing effect and gets rid of the annoying halo effects that AA sometimes causes.

The fact is, we never considered playing games with FSAA enabled until we tested the GeForce4. During benchmarking, we recorded performance hits of less than 5 percent when we enabled 2x FSAA or Quincunx AA in *Quake III*.

Anti-aliasing is a big reason to upgrade a GeForce3 to a GeForce4. As you can see from this *Bridge Commander* shot, enabling AA drastically reduces "jaggies."

Multi-mon goes mainstream

Sometimes a single 19-inch monitor just isn't large enough for all of the work you do. Adding an extra monitor, be it a flat-panel LCD or an old-school CRT, is an easy and inexpensive way to add desktop real estate to your system. Before the GeForce4 and Radeon 8500 were introduced, you had to sacrifice fancy 3D features in order to get a single-card multi-monitor solution. Luckily, nVidia decided to implement multiple-monitor support (dubbed nView) throughout its entire lineup of videocards, not just in its mass-market budget cards.

How did nVidia manage this? First, it integrated dual 350MHz RAMDACs in all GeForce4 cards to handle digital-to-analog signal conversion for CRT displays. This eliminates the need for expensive external RAMDACs. To go along with those RAMDACs, the GeForce4 cards include dualTMDS transmitters to drive dual DVI flat panels as well as dual CRTs. This means that videocard vendors can configure their boards to accommodate any combination of analog CRTs and digital flat panels.

In addition to the standard features that serious multi-monitor connoisseurs have come to know and love—such as advanced window positioning and profiles for different users on the same PC—the GeForce4 also has hardware support for even more advanced features, most notably, transparent windows. While we haven't found a particularly compelling use for it, the transparent window effect is super-cool just as eye candy.

Please note that while multi-monitor support is possible throughout the entire GeForce4 lineup, it's still an optional feature that has to be enabled by videocard vendors. So if you want multiple-monitor support, make sure it's offered in the card you want to buy.

Meet the GeForce4 family

As always, nVidia is packaging its latest technology in several different flavors. The two main iterations are the GeForce4 Ti and GeForce4 MX. Despite being called GeForce4s, the MX cards are intrinsically inferior to even older GeForce3 cards because they lack programmable shaders (see our GeForce4 MX report on page 34).

All of the GeForce4 Ti boards will sport 128MB of DDR SDRAM, but they'll be priced differently for different core and memory speeds:

THE GEFORCE4 TI 4600 is the fastest model and will ship with a 300MHz core and 325MHz DDR SDRAM for a whopping $400.

THE GEFORCE4 TI 4400 runs with a 275MHz core and 275MHz memory clock, with a price tag of $300.

THE GEFORCE4 TI 4200 sports a 275MHz core with 250MHz memory for just $200.

The only GeForce4 Ti board we've tested so far is an nVidia reference sample of the 4600, so it's difficult to give you a fair estimate of the overclocking potential of all these boards. But if past experience holds true, the Ti 4200 and Ti 4400 should both overclock reasonably well.

Should you upgrade to a GeForce4 Ti board? If you have a GeForce2, original Radeon, or slower card, the answer is yes. You'll see massive performance benefits and a stunning visual-quality boost with anti-aliasing enabled.

GeForce3 and Radeon 8500 owners should probably consider waiting for the next nVidia chip this fall (we don't know its name yet, but nVidia tells us it won't be called GeForce5). The GeForce4 is an incremental upgrade, and you probably won't see any major performance increases if you already own a bad-ass videocard. But of course, if you have to have the absolute fastest 3D accelerator money can buy, or desperately want to be able to use anti-aliasing, then the GeForce4 Ti is the way to go.

Dead-set on upgrading? Check out products from Leadtek **(www.leadtek.com)**, Asus **(usa.asus.com)**, MSI **(www.msicoputers.com)**, Visiontek **(www.visiontek.com)**, Leadtek **(www.leadtek.com)**, Gainward **(www.gainward.com)**, and PNY **(www.pny.com)**. All will have GeForce4 Ti boards when they're available at the end of February. Turn the page for full benchmarks and a rundown on the programmable-shader games on shelves today.

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3D TERMS DEFINED

Learning to speak 3D isn't something they teach in grade school, so if you're confused by some of the words used in this article, consult this handy lexicon.

ANTI-ALIASING Also known as AA. This rendering technique combats "jaggies" (rough edges on otherwise straight lines) in highly detailed 3D scenes by filtering higher-resolution images down to the game's display resolution. AA quality is measured by the number of samples that are taken for each pixel.

BUMP-MAPPING This is a rendering technique that creates the illusion of depth in textures without increasing the polygon count of 3D models.

DVI (digital visual interface) This specification defines how digital signals are sent to LCD flat-panel monitors, bypassing the digital-to-analog converters required by analog CRTs. Using a DVI interface precludes the possibility of video noise that can occur with digital-to-analog conversion.

MEMORY PRE-CHARGE Before a bank of memory is ready for read and write operations, it must have a current applied, i.e., a pre-charge.

OCCLUSION CULLING A form of hidden surface removal. Occlusion culling determines which objects are behind other objects in a 3D scene and prevents them from being rendered, thus saving memory bandwidth.

PIXEL SHADER Programmable shaders that calculate texture effects. They can be used for effects such as bump-mapping, reflections, and refraction.

POLYGON Polygons are geometric figures created by drawing lines between three or more points. Triangles and squares are examples of polygons. Most 3D models are created by combining thousands of triangular polygons into a mesh that forms a complex three-dimensional shape.

PROGRAMMABLE SHADER A highly specialized microprocessing unit that can run specialized 3D rendering programs at very high speeds.

QUINCUNX nVidia's proprietary anti-aliasing algorithm that calculates near–4x AA quality using just two samples.

RAMDAC (random access memory digital-to-analog converter) The RAMDAC converts digitally encoded images from your videocard into analog signals that are sent to your analog monitor.

TDMS (transition minimized differential signaling) The spec that describes how data is digitally sent across a DVI interface to a digital flat panel.

VERTEX SHADER A programmable shader that can calculate and manipulate the polygons that make up 3D models. They're used to render things such as hair, fur, and grass.

We Want Our DirectX 8 Games!

It's been a year since the GeForce3 introduced programmable shaders to PC game developers. So where are all the bloody titles that actually take advantage of the technology?

In the year since programmable-shader videocards were introduced, we've played only three games (*Aquanox*, *Ballistics*, and *Dronez*) that actually make use of the technology—and these titles, while visually spectacular, are short on gameplay. In fact, some people might call them nothing more than glorified tech demos for bump-mapping and volumetric fog.

Game developers are effervescent in their praise of programmable GPUs, but few have put their money where their mouths are. At least, not yet. We can't tell you that there will be dozens of programmable-shader games on shelves this April, but we can tell you that some spectacular-looking titles are on their way. For example, the much-anticipated upcoming chapters of *DooM* and *Unreal* are both slated to have programmable-shader effects—and these are both A-titles, through and through.

But why haven't we already seen more games that take full advantage of programmable GPUs? For that matter, why don't all games go the distance?

Dig: In order to fully utilize programmable shaders yet still support non-programmable videocards, game developers need to create two rendering engines. In many cases, the developers must also create unique art for each engine. Needless to say, the bean counters at the PC gaming studios have no interest in doubling development costs—despite the fact that programmers would love to implement the latest and greatest 3D rendering tricks.

The problem is exacerbated by the fact that too few gamers own programmable-shader videocards such as the Radeon 8500, GeForce3, and GeForce4. Despite good sales of these cards, they still make up just a fraction of the total installed base of 3D accelerators. In short, if you're running a company that needs to sell 500,000 copies of a game in order to turn a profit, you won't be able to do so if just 50,000 gamers can actually play your game. (We're using these exaggerated numbers to make a larger point; the 3D accelerator companies won't release total sales numbers.) A good A-list game—such as *Medal of Honor* or *Max Payne*—can potentially sell several million copies because it's playable on every machine sold in the past three years. From a business standpoint, it just doesn't make sense to limit that number by requiring programmable GPUs.

We're still waiting to see reflections like this in a shipping game.

The other factor that comes into play is the lengthy development time of PC games. Games like *Dark Age of Camelot*, *Unreal 2*, and the new *DooM* can take three years to develop. True enough, companies like nVidia do indeed have developer-relations departments that provide beta hardware to game developers and even show the developers how they can use new features. Nonetheless, integrating new 3D rendering features needs to happen relatively early in the development of a game. That's why titles like *Return to Castle Wolfenstein* and *Medal of Honor: Allied Assault* don't take advantage of programmable shaders—they were well into their development cycles before programmable-shader technology had congealed.

But at least the future looks bright. According to *Unreal* engine developer Tim Sweeney: "These things take time, but 2002 will be the breakout year for DirectX 8 features."

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GeForce 4: Does its performance take the gold?

All the vertex shaders in the world won't do you much good if they're lodged inside a chip that can't offer breakneck speed. So we ran a full complement of tests to see how the GeForce4 compares to its immediate predecessor, the GeForce3 Ti 500, which just so happens to be the current leader in 3D gaming frame-rate performance.

We tested the fastest iteration of the GeForce4 in our standard (though now relatively lethargic) 1.3GHz Pentium 4 test bed, which includes 256MB of RDRAM. We also threw the card into a 2GHz Pentium 4 machine loaded with 512MB of RDRAM. And for comparison's sake, we loaded that same 2GHz Pentium 4 machine with a GeForce3 Ti 500. As always, we ran our videocard benchmarks at 1280x1024 with 32-bit color, vsync disabled, and the highest detail settings possible. Here's the raw data.

	Quake III MaxPC	3DMark2001 Game 2, High Detail	3DMark2001 Game 4, Nature	3DMark2001 overall, default settings
GeForce4 Ti 4600/Pentium 1.3GHz				
No AA	65.0fps	73.0fps	31.2fps	6670
2x AA	67.0fps	58.0fps	22.3fps	6621
Quincunx	66.7fps	58.2fps	22.3fps	6284
GeForce4 Ti 4600/Pentium 4 2.0GHz				
No AA	103.8fps	87.1fps	31.8fps	9796
2x AA	90.6fps	62.2fps	22.4fps	8338
Quincunx	90.4fps	62.4fps	22.4fps	8302
GeForce3 Ti 500/Pentium 4 2.0GHz				
No AA	104.4fps	54.0fps	28.2fps	8014
2x AA	64.3fps	32.0fps	14.3fps	5636
Quincunx	53.5fps	29.8fps	13.9fps	5312

As you can see from our benchmarks, the GeForce4 isn't much faster than a GeForce3 Ti 500—until you enable anti-aliasing, which is a feature we've been looking to use for a long time.

In our *Quake III* benchmark, the GeForce4 Ti 4600 was actually a tad slower than the GeForce3 Ti 500 with anti-aliasing disabled for each card's test runs. But keep in mind that *Quake III* isn't memory bandwidth–limited, meaning it doesn't use all of a card's available video memory, even at the game's highest detail settings. But when we enabled anti-aliasing—thus increasing the amount of data crossing the cards' video buses—we saw all the performance dividends promised by the GeForce4's faster memory clock and optimizations to the Lightspeed Memory Architecture. While both the GeForce3 and GeForce4 scored around 100fps in *Quake III* with AA disabled, the GeForce4 was able to knock out 90fps with 2x AA enabled, while the GeForce3 was able to churn out only 64fps. Even though the GeForce4's memory is just 30 percent faster than the GeForce3's memory, the card runs about 41 percent faster in *Quake III* with AA enabled.

But why run 2x AA when you can run Quincunx AA, which uses a special algorithm to get near–4x AA quality for no extra performance hit? That's right, on the GeForce4, Quincunx AA runs at the same speed as 2x AA. Contrast this with the GeForce3, which, with Quincunx enabled, runs about 17 percent slower than with 2x AA enabled. Moral of the story: If you own a GeForce4, go ahead and fire up Quincunx. It's free!

As for the rest of our benchmarks, our *3DMark 2001* Game 2 benchmark is memory bandwidth–limited, so enabling 2x AA incurs more of a performance hit than in *Quake III*. Flipping the AA lever slowed us down around 30 percent, from 87fps to 62fps. The same hit occurred in our programmable-shaders test, Game 4. Interestingly, enabling Quincunx still incurred no inordinate performance hit in either of these benchmarks (in other words, Quincunx and 2x AA incurred the same hit).

The bottom line is that the GeForce4 is the best 3D accelerator available today. In most games, it allows you to use anti-aliasing at will for a truly tangible increase in visual quality. If you're running a GeForce2-level card or something even more archaic, leapfrog over the GeForce3 and go straight for the GeForce4—it'll spank the hell outta what you've got now. But if you're running a GeForce3 or ATI Radeon 8500, your decision becomes much more difficult. Does anti-aliasing mean that much to you? That's for you to decide.

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WARNING: The Videocard General has determined that the GeForce4 MX does not contain any programmable pixel or vertex shaders.

Will the real GeForce4 please stand up?

The latest value chip from nVidia might be a fine piece of technology, but it won't play the future's most spectacular games in all their visual splendor

Whenever nVidia rolls out its latest flagship 3D accelerators, it usually waits a few months before following up with its "value" line. Not so with the introduction of GeForce4. This time around, nVidia's entire top-to-bottom lineup is appearing at the same time. For bleeding-edge gamers, the GeForce4 Titanium series represents the pinnacle of 3D features and performance. For the budget market, the GeForce4 MX series clocks in with affordable 3D performance. And even notebook gamers are getting a piece of the action, care of the GeForce4 Go.

You might assume that regardless of which GeForce4 you buy, at the very least you'll get a card that builds on the technology introduced in the GeForce3. You might also assume that because all the cards in the GeForce3 lineup included programmable shaders, the entire lineup of GeForce4 cards would as well. But you'd be wrong.

Both the GeForce MX series and the GeForce4 Go series lack the programmable pixel and vertex shaders that made the GeForce3 such a revolutionary technology. It's not such a big deal for the GeForce4 Go chip because there's no fancy-shader alternative for notebook PCs at this time. But defining the MX accelerator as a GeForce4 appears to be a growing problem for nVidia.

Indeed, game developers and PC hardware enthusiasts are saying that the use of the GeForce4 moniker for the new MX will lead to consumer confusion and actually hurt the sales and adoption of games that use programmable shaders. The fear is that consumers will reach for a GeForce4 MX, believing it supports all the latest 3D features, then feel the sting when they discover the chip can't render stunning shader effects.

But is nVidia entirely out of line with its naming decision? To borrow an analogy from the world of automobiles, Chevy used to sell two versions of the Camaro—one with a high-output V8 and one with a detuned V6—but no one ever demanded that the V6 be called a Cavalier.

Fair enough. But both the Camaro and Cavalier could take you down the same road, albeit at different speeds. It wasn't as if the Cavalier just plain didn't run on certain turnpikes the way the GeForce4 MX just plain doesn't render the pixel- and vertex-shader effects in next-generation games.

An official for nVidia says the griping is unfair.

"The GeForce4 MX family is the world's most powerful mainstream graphics processor, combining outstanding performance and integrated functionality," says Derek Perez, an nVidia spokesman. "The GeForce4 Ti family continues the tradition as the most powerful, no-holds-barred graphics processor on the planet. Both incorporate the core values of GeForce4—anti-aliasing, nView, and performance.

"While there is no perfect solution to naming and branding, calling NV17 anything other than a GeForce4 would have been doing the product and its customers a disservice," Perez says. "The combination of the MX and Ti families, along with the model-number differences—three-digit versus four-digit—provides adequate separation between the two products, allowing each to stand on its own, in its own class."

Jon Peddie, a graphics industry expert, argues that the people who will buy the GeForce4 MX aren't the sort who play games like *DooM 3* anyhow. Instead, they'll be attracted to the MX's lower price and multi-monitor support. Peddie also says that developers should stop their bellyaching and get on with coding games that use the pixel and vertex shaders—features that have been available since the release of the GeForce3 and the Radeon 8500.

While it doesn't share all of the functionality of the Titanium line, the GeForce4 MX is no slouch. Compared to the GeForce2 MX, the card is roughly four times as fast and provides softcore gamers with better visual quality, thanks to its faster AA support. The softcore crowd also gets 128-bit DDR memory and LMA II, as well as full hardware support for DVD movie playback.

"You get what you pay for," Peddie says. "Perhaps nVidia did themselves a disservice by branding the NV17 as a GeForce4, but the GeForce4 MX is a replacement for the TNT. It's the workhorse for the mid- to low-end—that market segment doesn't need vertex and pixel shaders."

Although some gamers may still get burned by not understanding the MX's limitations, nVidia's aggressive pricing could ultimately render the argument moot. The budget GeForce4 Ti 4200, for example, has 128MB of memory and will retail for $200. That's just $20 more than the GeForce4 MX 460.

For additional commentary on the GeForce4 MX, see our sidebar, "What do game developers think about the GeForce4," on page 28.

—GORDON MAH UNG

GeForce4 MX at a Glance

Code-name	NV17
Core	29 million transistors on a 0.15-micron process
Memory	64MB 128-bit DDR SDRAM
The models	MX 460 300MHz core/550MHz memory, $179
	MX 440 270MHz core/400MHz memory, $149
	MX 420 250MHz core/166MHz memory, $99

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Clockwise from top:

The Sharp VL-NZ150, the Canon Elura 10, the Panasonic PV-DV51D, and the Sony DCR-TRV17

Digital VIDEO CAMS Descend

BY JOHN TUMMINARO

Digital video cameras are going up in quality, but coming down to earth in price. We look through the lenses of four prosumer-level cameras and tell you how to buy the right one for PC-based video production.

We can't blame you if you've been hesitant to lay down money for a digital video camera. Not so long ago, a DV cam that even approached professional quality was priced in the stratosphere—and if you paid anything less, you got something more akin to a Happy Meal toy than a device that shoots moving pictures. But it's time to take another look. In this feature, we review four digital video cameras that don't skimp on the extras, and they're all priced around $1,000 or less. Basic buying advice starts on page 38; camera reviews start on page 40.

If you're reluctant to take the digital plunge, consider some of the advantages of digital video. First, unlike analog video tape, digital video suffers no degradation after hundreds of viewings. Nor will it suffer the "generation-loss" that affects analog video when it's transferred from tape to tape during editing escapades. The upshot is that your edited video—and all the copies made from it—will always look as sharp as your original master. And maybe now's a good time to mention that DV cams can offer surprisingly high-quality output. Indeed, more and more independent filmmakers are using DV instead of film in order to save buckets of money while still retaining acceptable visual quality (though, if you've seen some of the movies playing in indie houses lately, you know that even good DV visual quality can't compensate for the self-indulgent meanderings of a Tarantino wannabe).

Second, editing analog video on your PC can be unnecessarily complicated and expensive—it requires the purchase of a separate video-capture board, which, by the way, subjects your video to image degradation. Not so with digital video, where editing DV footage is as simple as jacking your camera into your PC's FireWire port. Once your footage is inside your PC, you can take advantage of the awesome features found in most DV editing apps: automatic scene detection, nondestructive editing, and realtime MPEG-2 compression, all of which make editing a relative snap. And once you're done editing, you can output your material to a format that's compatible with set-top DVD players—perfect for burning your own DVDs or VCDs.

Although digital video cameras still aren't cheap, the four cameras we trotted out into the field contain an amazing amount of features for the money. They're all one-chip cameras—that is, they all use a single CCD (charged-coupled device) to capture video. A CCD is essentially an imaging sensor that captures light and converts it into a digital image (see "Getting to Know Your Digital Camera," May 2001).

Each camera in our roundup has some form of still-shot capability, but you should be aware that even the highest-end DV camera can't match the still-image quality of a dedicated digital still camera. But if the idea of quick, quality video makes your monkey stand up and chatter, then check out what a grand will buy you in today's DV cam marketplace.

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"MiniDV is the most popular format for consumer digital video cameras, and we don't see it being supplanted any time soon."

Digital Video Cheat Sheet

What you need to know before buying any DV cam

Choose the Right Format

Three digital-video formats dominate the consumer DV market: MiniDV, Digital8, and MICROMV. Although they offer comparable image quality, there are still essential differences worth noting. MiniDV is the most popular digital format, and we don't see it being supplanted any time soon. MiniDV uses tiny cassettes that can record up to one hour of compressed video in the high-quality SP mode. The cassettes are loaded with metal evaporated tape, but make no mistake: Their content is digital, not analog as you'd find in a VHS tape. All the camcorders in this roundup are based on the MiniDV format.

MICROMV is a new format that Sony recently announced for its line of ultra-compact camcorders. Apparently, MiniDV tape is so damn humongous, it has actually prevented Sony from reducing the size of its DV cameras—so the company decided to shrink down the tape even more. From a functionality and quality standpoint, MICROMV is little more than a smaller version of MiniDV and theoretically offers identical recording quality. We have yet to receive a MICROMV camera for testing.

Digital8 is based on old Hi8 cassette tape and has been relegated to the extreme low-end of the market. As well it should. This hoary geezer doesn't support some of the advanced editing features that the other formats do, such as batch-capture and time coding—the kind of features that would compel you to buy a DV cam in the first place. Unless your budget is extremely tight, you should avoid Digital8 entirely.

Pro-level formats include DVCPRO, DVCAM, and Digital Betacam. For the average Joe, these offer little more than higher prices, so stick with the more consumer-oriented formats.

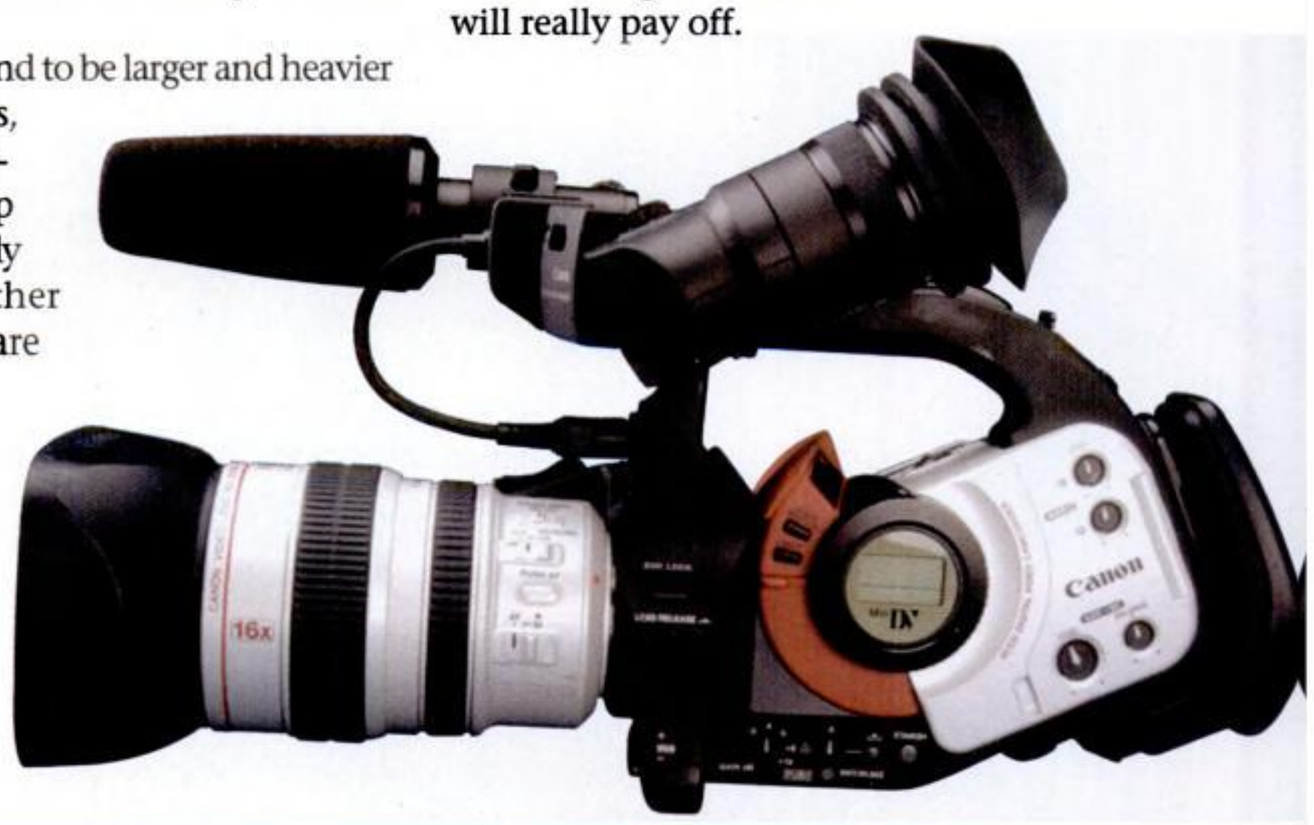
Prosumer vs. Consumer

The gap between high-end prosumer DV cams and garden-variety consumer models is quickly diminishing, though a few fundamental differences still exist. For starters, a prosumer cam—such as the Canon XL1 pictured on this page and reviewed in October 2001—gives you much finer control over features such as white balance, audio gain, and exposure settings. And not only are these controls more precise than those found in consumer cams, they're also easier to access because they're implemented in conveniently placed dials rather than in nested LCD menus. Higher-end cameras also deliver far greater color accuracy, thanks to their use of three CCDs for video capture—one CCD for each of the primary colors. Consumer cams typically use only a single CCD, though we have to note that one-chip cams are rapidly approaching the quality of their three-chip brethren.

Prosumer DV cameras also offer more options for high-quality audio. While a consumer cam might have an auxiliary input for microphones, prosumer cams usually come equipped with good onboard mics and balanced audio inputs (high-end connectors that reduce noise) for add-on audio devices. Prosumer cams also sometimes come with removable lenses that can be swapped with specialized lenses for wide-angle or telephoto shots.

Prosumer cams tend to be larger and heavier than consumer cams, and their general heftiness can actually help you shoot more steadily and execute smoother pans. Smaller cams are easier to lug around, but their cutesy shapes and compact designs don't lend themselves to graceful, freehand camera movements.

If you simply want to shoot video of your friends, family, and crazy next-door neighbors doing God knows what, then a prosumer camera would be gross overkill. But if you need to have complete control over your shots and want the best man-to-machine relationship possible, then the high-end cams will really pay off.



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"If you don't want to record audio while shooting on location, you can record a commentary track and add it to the video later."

Zoom and Image Stabilization

You'll sometimes see the claim of "300x digital zoom!" emblazoned on digital video cameras. So what are these things, DV cams or military-grade surveillance devices? The truth is that such zoom figures are largely meaningless. A digital zoom basically does for video what the magnifying glass in *Photoshop* does for still shots—it enlarges the picture through interpolation, causing unacceptable pixilation and blocky, Lego-like images. The only figure that really matters is a camera's *optical zoom* capability, which zooms in without resorting to artificial digital trickery. So look for a high optical-zoom spec if you want zoom at all.

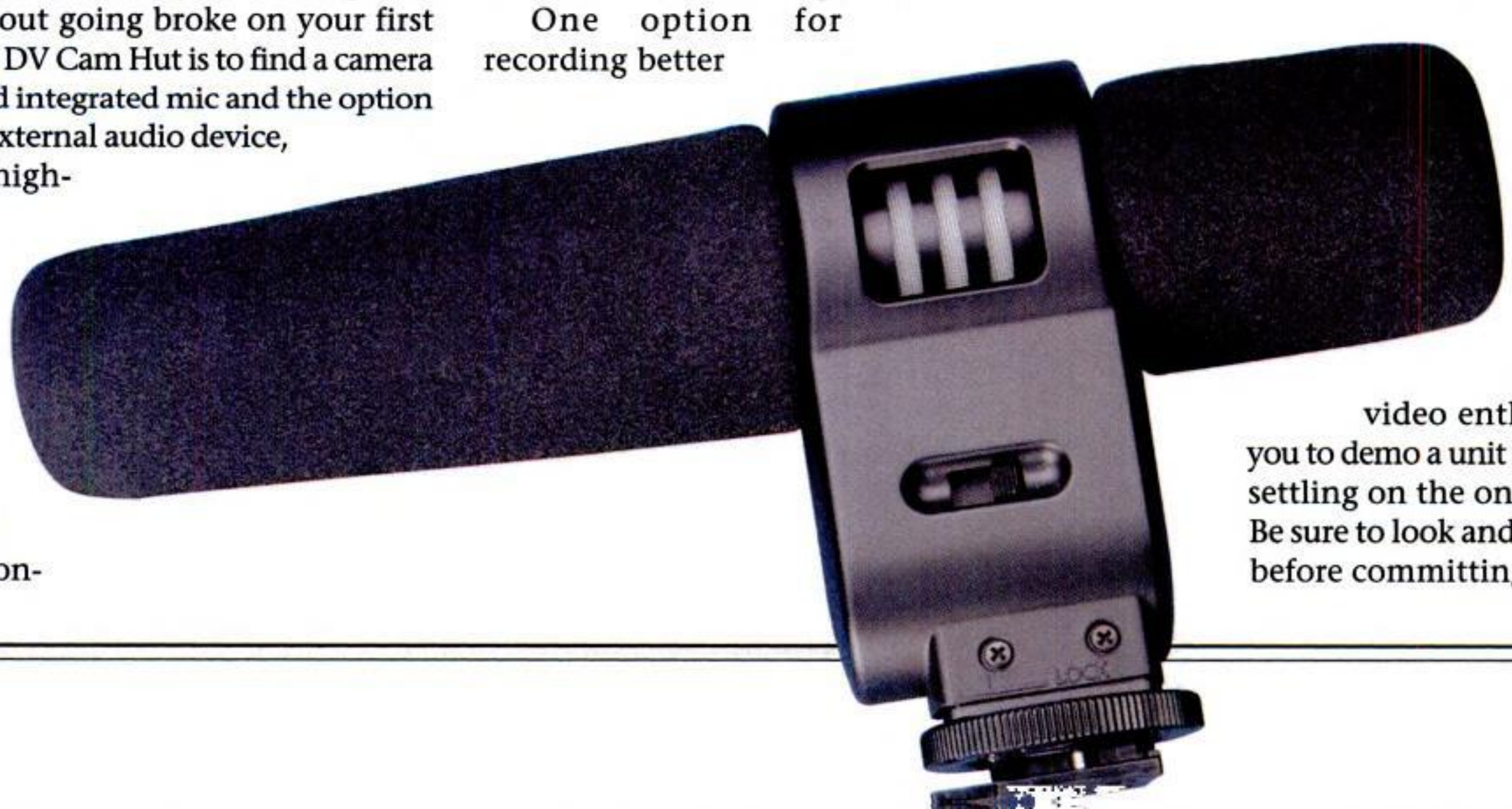
Just about every DV cam will tout "image stabilization" as a key feature. Image stabilization works to mitigate all the jerky movement caused by freehand shooting, and it can be extremely effective. However, image stabilization comes in a couple of flavors. You guessed it—optical and digital. All of the cams in this roundup use digital image stabilization, which means that the feature is adjusted by the camera's internal circuitry, which can cause a loss in image quality. Optical stabilization, on the other hand, actually adjusts lens position in minute degrees to compensate for jittering. Because optical stabilization adjusts only the lens and doesn't mess with your footage, image quality doesn't take a hit. Until very recently, optical image stabilization was found only in high-end cameras such as the Canon XL1, but it's quickly finding its way into lower-end models, and not a minute too soon.

All about Audio

While image quality is obviously paramount, you should never take a camera's audio subsystem for granted in your quest for the perfect camera. It's easy to spot an onboard mic and mentally cross audio off your checklist, but good sound is critical to the video experience, and your projects should be no exception.

The best way to keep your audio options open without going broke on your first trip to Jeff's DV Cam Hut is to find a camera with a good integrated mic and the option to add an external audio device, such as a high-end microphone or a boom mic. Keep in mind, however, that the audio-in connection on a consumer DV cam won't be the balanced XLR input found on professional cams, which significantly reduce noise and hum. So you'll need an adapter to hook up serious professional equipment to your camera's Mini-DIN jack. Some cams even come with expansion ports to mount boom mics and other devices directly, bypassing the Mini-DIN jack altogether.

One option for recording better sound than you would get from your consumer DV cam is to record to a separate outboard device, such as a DAT (digital audio tape) deck. The sound can then be integrated and synched to the video during post-production. Nonlinear editors, such as Adobe *Premiere*, allow you to place multiple audio tracks right on top of each other. You could even record a commentary track in the comfort of your own home and add it to the video later.



And don't forget the golden rule: Try before you buy. Many stores that cater to video enthusiasts will allow you to demo a unit for a few days before settling on the one you want to buy. Be sure to look and listen to the results before committing.

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"Some people prefer the softer, film-like look of the Canon Elura's images...and when it comes to features, Canon packs a lot into its modest little chassis."

Canon Elura 10

Small and awkward, but its video and sound quality are undeniable

The Canon Elura 10 is so small it could probably be mistaken for a webcam. Sounds intriguing, we know, but more often than not, the Elura's compact size turns out to be a negative. Although it's unquestionably portable and convenient for travel, the camera is just plain difficult to hold and manipulate. All of its controls are within reach, sure, but the camera felt loose and awkward when operating the zoom control. Even worse, panning quickly became a chore, as we had to constantly reorient our grip in order to keep the camera steady. Small-handed carny folk may find the Canon's size and shape to be ergo-friendly, but if you have "normal-size" hands, you should definitely play around with the Elura for a few minutes in the camera store before plunking down your cash.

The Canon's video was a hair softer than the Sony's, and its color accuracy wasn't quite as good either—the color of a red brick building in one of our tests was a little too saturated. Nonetheless, most of the Canon's video appeared noticeably brighter than the Sony's, and some people prefer a softer, film-like look over Sony's harsh take on reality. All Sony and Canon DV cameras—from the lowliest consumer cams to the most expensive pro-levels cams—seem to share the softness/sharpness characteristics of the models reviewed here. Deciding which way to go is really a matter of personal choice, so check out the sample videos on the April Maximum CD and decide what type of image quality is right for you.

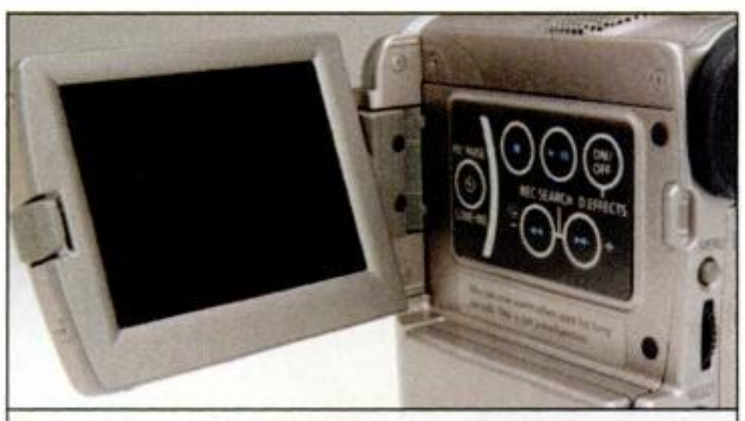
The Canon suffered some blurring during high-motion sports shots, but it was slight if noticeable at all. Under intense sunlight, the camera's automated white-balance gave skin tones a very washed-out look—the worst of the group. Fortunately, the skin-tone problems were anomalies that cropped up only when shooting under the most extreme lighting conditions; adjusting white-balance with the camera's manual control should help get rid of the problems entirely. The Canon's lens packs a 10x optical zoom, which isn't as high as the Panasonic's, but is more than respectable given the camera's diminutive size.

When it comes to features, the Canon packs a lot into its modest little chassis. You get a small but sharp LCD, a color viewfinder with a retractable eyepiece, and a progressive scan mode. The progressive scan mode is good for shooting still images because it effectively doubles the amount of visual information in each shot. However, we didn't like what progressive scanning did during video shoots—frame rates were unacceptably choppy (you get twice the visual information in each frame, but only half the number of frames per second). Canon's low-light mode isn't as advanced as Sony's Nightshot, and won't illuminate total darkness, but it does give a decent-enough boost to your ambient light levels.

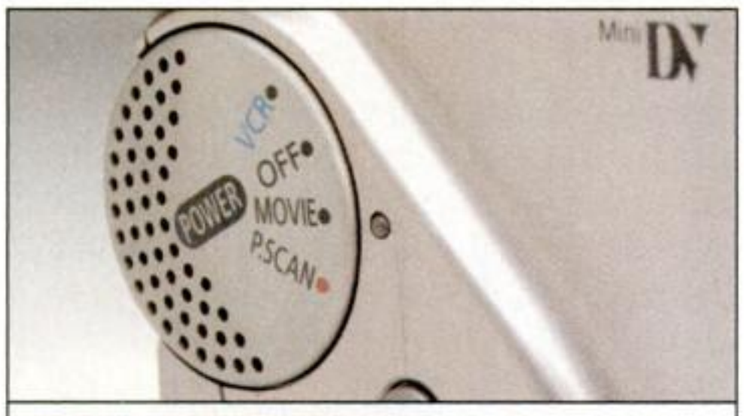
Canon surprised us most during audio testing. Despite seemingly poor mic placement, audio pickup was excellent and wind noise was the lowest of all the cameras in this roundup. We were disappointed that the Canon didn't include an external mic jack like the Sony did, but its onboard audio was so good, we felt we didn't need an external mic most of the time.

The folks at Canon did an exemplary job with the Elura 10, focusing their efforts on packing a small case with excellent video and audio quality. Still, a few features were left out, most likely to meet self-imposed size and price requirements. We found the Canon awkward to control, but if you swear by a camera with a vertical formfactor—or have the wee digits of the "Lil'est Intern"—you'll probably find a lot to like in this tiny performer.

SPYWARE: The Canon's petite dimensions make it easy to conceal, should you have any reason to do so.



HOME THEATER: The Canon's LCD folds out to expose a small group of playback controls—perfect for checking out your footage on the road.



DIAL-A-MOVIE: You can easily switch between regular and progressive scan mode with the turn of the dial.

POP-UPS: The viewfinder retracts for even more portability.

MAXIMUM PC VERDICT

MARTIN SHEEN: We liked the bright and slightly diffuse quality of the video, and the high-quality audio was a big surprise for such a tiny DV cam.

CHARLIE SHEEN: There's the awkward grip to contend with, and direct and intense lighting didn't fare well in the Elura footage.

CANON **$1,100**
Elura 10
www.usa.canon.com

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"The Panasonic is midrange in almost every category...but at hundreds of dollars less than the competition, it's still a good value for weekend videographers."

Panasonic PV-DV51D

A whale in a sea of dolphins

The Panasonic PV-DV51D camera has a traditional horizontal formfactor, much like the Sony, but it's much larger and less streamlined than others of its ilk. The Panasonic isn't heavy, mind you, but its girth feels excessive, especially considering how many features the Canon Elura was able to cram into such a small space. And even though it costs about as much as the Sharp VL-NZ150, the Panasonic has a plasticky texture that feels cheap.

Ergonomically, the Panasonic is a mixed bag. Its zoom and menu jog dial are within easy reach, but the main menu button is in the worst possible location, just above the record button, requiring a second hand to reach. This is bad news because the menu hides important features such as the white-balance and recording mode controls. It's difficult to get a good grip on the Panasonic because it's so damn wide, but at least its record and zoom buttons are large and easy to reach.

BIG 'N' BLAND: The Panasonic's cheap construction didn't exactly make us do cartwheels.

LCDINKY: The tiny LCD reminds us of the joy of watching in-flight movies.

INSTANT REPLAY: Playback on the Panasonic is a snap with its VCR-esque interface.

NICE TOUCH: The zoom buttons are so big, you'll never forget which is which.

The cam's playback controls ape the traditional VCR interface and are very convenient for watching captured footage. The Panasonic proudly proclaims a 300x digital zoom function—the highest in this roundup—but we all know how useful this is. Its 18x optical rating is also the highest in our roundup, which certainly doesn't hurt, but doesn't make as dramatic a difference as its number might imply.

It would appear that Panasonic's monitoring capabilities suffered the most corner-cutting. The LCD display is sharp but not terribly helpful under direct light, where glare becomes a problem. The screen also seems undersized in relation to the camera's size. And while the black-and-white viewfinder no doubt shaved off a considerable amount of money from the camera's price, we still would have preferred color. The Panasonic permits low-quality stills, but provides no easy removable media method for retrieving them, opting to record them to the DV tape, much like the Canon Elura (the Sony saves stills to a Memory Stick). Unlike the Elura, the Panasonic takes forever to actually record still shots, making the whole endeavor an exercise in tedium. Don't even think about using this cam as your primary source of still photography, unless you've spent half of your waking hours in Soviet bread lines.

Panasonic earned our respect when we pulled the PV-DV51D off our tripod and started shooting in the field. Pans were steady and zooms were precise, though we found it was easier to keep the camera steady when we used both hands. Video quality was acceptable, though it wasn't as sharp as Sony's, nor as colorful as Canon's. The auto white-balance feature yielded abnormal contrast levels but nothing as wacked-out as the Canon Elura 10's. And of course, white-balance can be tweaked manually.

The autofocus worked well, yielding well-defined colors, but the zoom control was a royal pain to modulate—the setting between gradual zoom and speedy zoom was too abrupt, causing us to occasionally zoom much faster than we had anticipated. The mic also picked up a lot of noise in windy weather.

The Panasonic sounds average because it is. We couldn't find any glaring faults in its video quality or features set, but we couldn't find a great deal to praise either. Altogether, the Panasonic is midrange in almost every category and is definitely not appropriate for DV connoisseurs. But considering that it costs hundreds of dollars less than the Sony or Canon, it's still a good value for weekend videographers.

MAXIMUM PC VERDICT

THE GOOD, THE BAD, AND THE UGLY: It makes a lot of compromises, but at this price, you won't be likely to shred documents and declare bankruptcy afterwards. And we dig the beefy zoom buttons.

THE COOK, THE THIEF, HIS WIFE, AND HER LOVER: This cam's got a bad case of the blahs. It's also too bulky and comes with a lame black-and-white viewfinder.

PANASONIC **$600**
PV-DV51D
www.panasonic.com

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"The Sharp consistently produced the sorriest video of any of the cams in our roundup...there were times when we thought we were viewing the footage of a webcam!"

Sharp VL-NZ150

A DV freak of nature

Sharp gave its mid-level digital video camera an innovative and unconventional design. Unfortunately, we don't have innovative, unconventional hands. In order to grip this camera for shooting, we had to place our index finger right beneath the lens, which made reaching the zoom controls with our thumbs very awkward. The more comfortable alternative was to place our index finger above the lens, but at the expense of covering the mic that's mounted there. The right side of the camera, which houses the lens, rotates for easy angle changes. But this is a small comfort if you can't hold the camera properly in the first place.

CUBISM: The Sharp packs everything into an intriguing, if not utilitarian, shape.

DO THE TWIST: The rotating body of the cam is great in theory, but its application is pretty lame.

POP CARTS: An MMC slot and 16MB card are thrown in for easy movement of your still pictures.

PIXIE BUTTONS: The standard controls are all here, they're just too damn small and hard to use

Although the Sharp generally feels solid, its build quality is suspicious. The lens cap looks like it came out of a gumball machine, and the battery hangs from the underside and looks tacked on. It's a good thing the Sharp's LCD is top-notch because the camera doesn't even have a viewfinder, and manual adjustments to the focus and white-balance controls were exactly where they *shouldn't* be—buried in a difficult-to-use menu.

And it only gets worse from there.

The Sharp consistently produced the sorriest video of any of the cams in our roundup. We saw a great deal of video noise and artifacting in our test footage, and color accuracy was downright lousy. The colors of our beach shots were washed out (like those old photographs of your mom in horn-rimmed glasses), while other shots were oversaturated. In fact, there were times when we thought we were viewing the footage of a webcam instead of a DV cam!

Under direct sunlight, the Sharp's video quality fared well enough, but no matter how good an LCD is, you still need a viewfinder when you have direct sunlight at your back. Because the Sharp's LCD lacks a cover and is placed right next to your left hand, its surface quickly accumulates fingerprints, which seriously obscure the screen and demand constant cleaning. Overall, shooting with this odd design turned out to be a logistical nightmare. We found it very difficult to track a moving object while keeping the camera steady. The zoom control is precise and easy to modulate, but felt unresponsive at times, and the autofocus had a very difficult time keeping up. Audio quality didn't fare much better: Wind noise made the voices of our subjects almost indiscernible. There's also no external microphone jack, which is sorely needed given the inadequate onboard mic.

The Sharp includes a USB port and MMC slot for saving and transferring still shots. That's just super—or it would be if the still-shot quality even approached acceptability. We wish Sharp had cut out still-capture entirely to focus all its efforts on addressing video-quality issues.

In short, the VL-NZ150 is a camera designed for the soccer-mom crowd. It has an attractive design that looks functional, but later turns out to invite a mess of problems. Unless Sharp is planning a redesign of its imaging components—as well as a redesign of the human hand—the VL-NZ150 isn't worth your time or money.

MAXIMUM PC VERDICT

MATTHEW BRODERICK: Most electronics stores offer the option of a refund agreement.

MATTHEW LILLARD: Terrible video quality, no viewfinder, awkward control placement, sluggish zoom. Shall we continue?

SHARP *VL-NZ150*
www.sharpusa.com

$800

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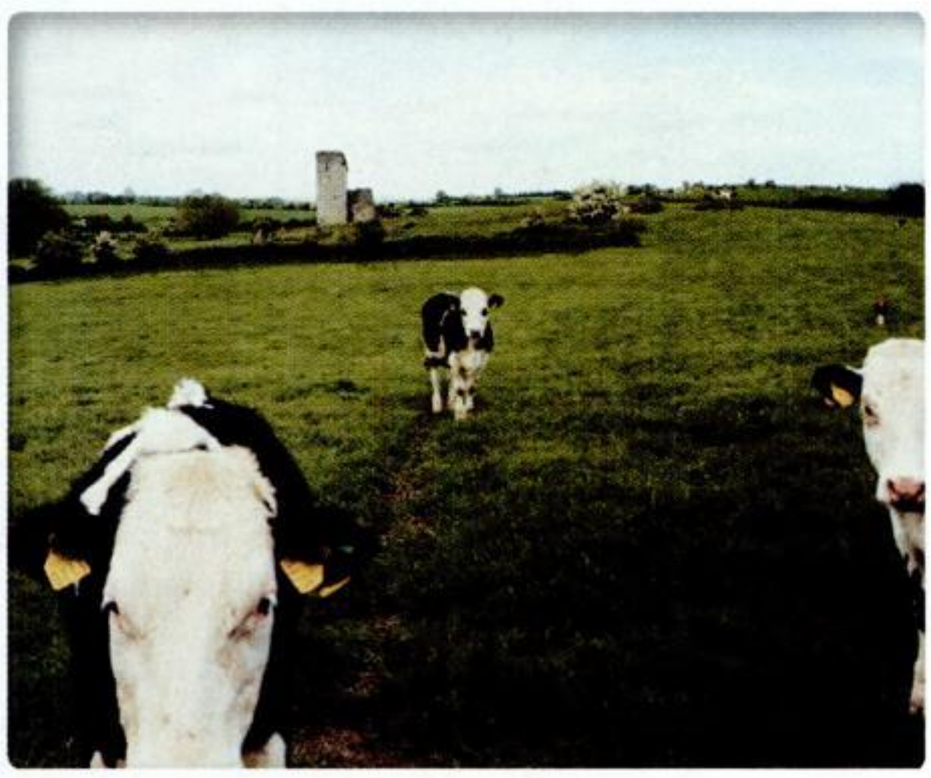
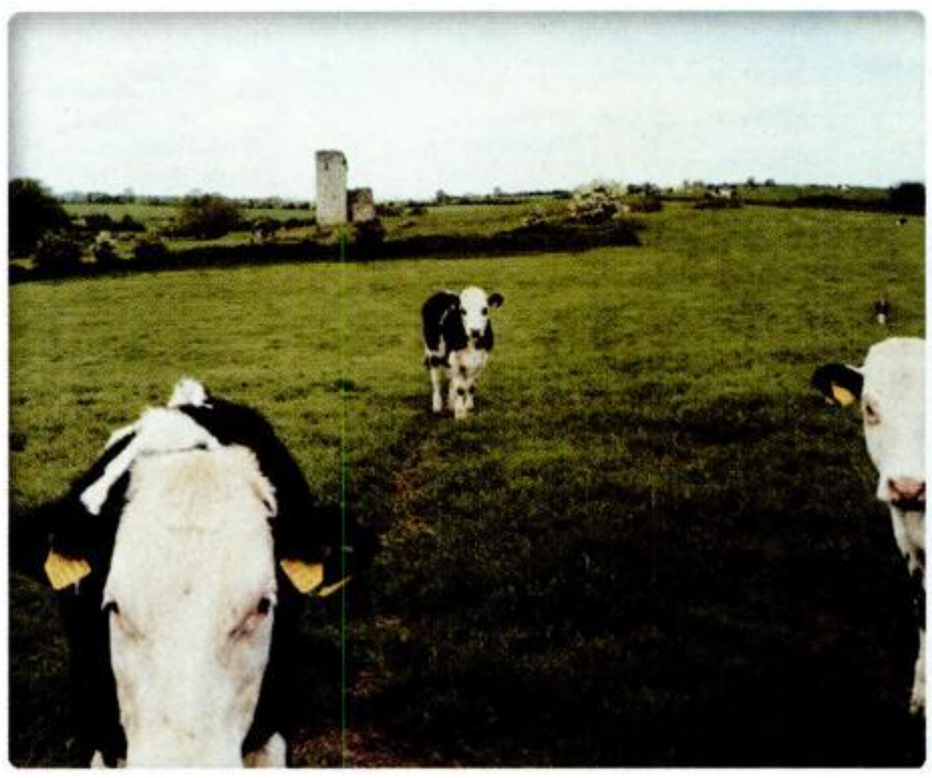
"Music is a tried and true way to add drama and impact to your videos. As you can see here."

Before music.



After music.



DUN-dun-DUN-dun-DUN-dun… What would the shark footage in *Jaws* be without that, huh? Or what if they'd used "It's A Small World" for the shower scene in *Psycho*?

Clearly, music can make a world of difference—especially in your home videos. And Pinnacle Studio™ version 7 makes it amazingly easy to jazz up your videos with music—your own or choose from a built-in library of songs and sounds—along with hundreds of special effects, **titles, and transitions.** Then burn 'em to CD or DVD with Pinnacle **Express™. Now,** along with preserving memories, you're creating **tightly edited** cinematic works of art. It's fast. It's a blast. And it's **made** possible by Pinnacle Systems, the folks who've won 8 Emmys **for** Technical Achievement. So, whether it's "Home On The Range" **or an old** Def Leppard tune, adding music is just one of the ways Pinnacle can bring your videos to life.

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"Sony's low-light compensation feature is called Nightshot...and shoots infrared beams in front of the camera to illuminate objects—even in total darkness."

Sony DCR-TRV17

A little extra dough gets you a lot of extra show

Although we weren't immediately blown away by the boxy, stout appearance of Sony's DCR-TRV17, its modest design quickly grew on us. The Sony isn't nearly as sleek as some of the other cameras we tested, but its horizontal design lent itself to maximum maneuverability—the TRV17 turned out to be the easiest cam in the roundup to keep steady while panning without a tripod. Like the three bears checking out Goldilocks' pad, we found that this cam was neither too small (like the Sharp and the Canon) nor too big (like the Panasonic), but rather juuust right. And its zoom control is a work of art—easy to modulate and in exactly the right place so your fingers won't slip while tracking your prey.

HAND-Y: The Sony isn't the most compact DV cam, but the comfortable shape lends itself to more graceful and accurate filmmaking.

BIGGER ISN'T ALWAYS BETTER: The TRV17's LCD isn't nearly as sharp as some of its challengers'.

The LCD monitor, while the largest of the pack at 3.5 inches, isn't quite as sharp as some of the others in this roundup. In fact, we typically found ourselves using the viewfinder for location shots—it's clear, easy to move up and down, and in color. The LCD will work for most situations, but when exposure to direct sunlight is a problem, the viewfinder delivers a fantastic image with minimal glare.

The Sony's menu controls are difficult to use because they require you to open the LCD, but at least all of the camera's primary functions—such as zoom, record, and still-capture—are within reach. The nested menus are navigated with a scroll wheel that works well but is in the wrong place entirely. Look to the Canon Elura for button placement done right.

THANKS, CARL!: The Carl Zeiss lens provided the best all-around video images in this roundup.

We love that the manual focus control is on the lens where it should be, instead of on a multifunction scroll wheel. Speaking of the lens, the Carl Zeiss model that Sony uses delivers accurate color, and the brightness controls and autofocus work great when doing sudden zooms. The color accuracy of the Sony is better than that of the Canon, though its colors are less rich, which is often the case when color accuracy takes precedence over colors saturation. Sharpness is also top quality, giving the Sony video a more defined look (depending on your taste, it might even be a little *too* sharp). Auto white-balance gave us the lowest contrast levels under very bright conditions, and helped Sony dominate the image-quality competition. If your issue of *Maximum PC* came with a CD-ROM, check out the test videos to decide for yourself.

IT WOULDN'T BE A SONY: ...without a Memory Stick slot. Too bad the picture output wasn't good enough to make us want to use it.

Audio is also a Sony strong point. Although the Sony picked up slightly more wind noise than the Canon, its long range pickup was better. Sony also includes a mic jack for you to connect an external microphone—a nice touch when you want better audio than the onboard unit provides.

Sony's low-light compensation feature is called Nightshot, and it takes a more radical approach than schemes that simply vary shutter speed. Nightshot actually shoots infrared beams in front of the camera to illuminate objects—even in total darkness. It works well and doesn't cause the stuttering effect that results from shutter speed changes. Like all the cams in this roundup, the Sony captures 640x480 still-shots, but falls at the bottom of an already hobbled pack. Once again, let's all repeat: *No one should ever expect good still-shots from a DV cam*. Learn it, live it, love it.

MAXIMUM PC KICK ASS PRODUCT

The DCR-TRV17 might be Sony's entry-level DV cam, but it didn't feel very entry-level to us. It boasts the best overall image quality of any cam in this roundup, proved to be the easiest to use, and comes with the greatest feature set. Although it suffers a few shortcomings, we realize that when it comes to what counts—shooting high quality video—the Sony kicks ass.

MAXIMUM PC VERDICT

BRANDO THEN: Great image quality and packed with features. Its ergonomics spit in the face of the smaller cams.

BRANDO NOW: The still-shot pictures suck, and we really wish the image control options weren't buried in menus.

SONY **$1,100**
DCR-TRV17
www.sel.sony.com

9

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"What's more important to you, ergonomics or image quality? A quick glance at the chart below should help you pick the best camera for your needs."

The Final Cut

We call it a comparison chart, but you can call it Verdict-o-Mania!

Whether you'll be filming in a backlot or in your own backyard, you have to prioritize your DV cam needs. What's more important to you, ergonomics or image quality? A quick glance at this chart should help you pick the best camera for your wants and needs. And don't just assume that the camera with the highest *Maximum PC* verdict is the best one for you. For example, if you intend to shoot only handheld footage of moving targets, you'll want a light camera that fits comfortably in your hand. But if you'll be shooting only with a tripod, then image quality and audio pickup ought to be your biggest concerns.

In addition to rendering final *Maximum PC* verdicts, we graded each camera in different subjective categories. Please note that our final verdicts were *not* averaged from these individual scores.

	Canon	Sony	Sharp	Panasonic
Features	The progressive scan mode is unique, and the retractable viewfinder allows even greater portability. **8**	Sony-only features such as Nightshot, Memory Stick support, and analog input make this the most feature-packed cam in the bunch. **9**	The MMC slot is nice for the price, but the lack of a viewfinder is inexcusable. **6**	It's got the highest optical zoom of the bunch, but omits too many key features such as a color viewfinder and large LCD. **5**
Ergonomics	Too small for our hands, but still feels solid. **7**	A perfect ergonomic fit. **10**	If you find this camera comfortable, we'd like to visit your mother ship. **3**	A little oversized, but with a solid feel. **6**
Image Quality	Soft, saturated colors, but color accuracy was a little off. **8**	Sharp, detailed, minimal artifacting and excellent color accuracy. **9**	Horrible artifacting, washed-out colors, and generally dull footage. **2**	Sharp detail, but color saturation wasn't the best. **6**
Audio Quality	Excellent audio pickup and minimal interference from wind noise. **9**	Good resistance to wind noise and great audio pickup at long ranges. **8**	Wind noise rendered voices indistinguishable from the background, and the pickup range was the shortest. **5**	Wind noise was intolerable, but under normal conditions the pickup was fairly good. **6**
LCD	Very sharp, but a little small. **8**	Nice and big, but not quite sharp enough. **8**	Big and sharp, but highly susceptible to fingerprints. **7**	Sharp, but too small and not great under direct light. **6**
Value	You get a lot for your money, but a removable media slot is mandatory at this price. **7**	Expensive, but you get what you pay for. **9**	Rock-bottom price, but rock-bottom quality. **3**	Decent video quality considering the fire-sale price. **7**
MAXIMUM PC VERDICT	A nice cam, if you don't need a removable media slot and you like the small formfactor. **7**	For the price, it doesn't get any better then this . **9**	You've been warned: Avoid at all costs. **3**	Average, but if you're on a tight budget, this cam starts looking mighty good. **6**

REMINDER: *Final verdicts were* not *averaged from individual category scores.*

You Could Be A Winner: *Grand Prize for themed contests on America's Funniest Home Videos: $100,000. Grand Prize for contestant shows: $10,000. Categories include: "Silly blunders at social occasions, unexpected foul-ups involving children, animal antics, home music videos, life's annoyances."*

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Maximum PC proudly presents...

The 2nd Annual GEEK TEST

You've survived the hellish ship-breaking yards of JiangYin. You've weathered three months of dysentery in a Peruvian jail. You've even endured an armed stand-off with the tribal elders of Peshawar. But you'll never know the true meaning of perseverance until you've gone toe-to-toe with the world's geekiest PC experts. Their minds are sharp, their hearts are cold, and their desire to embarrass PC newbies is exceeded only by their thirst for more CPU power.

Talking shop with PC geeks is all about one-upmanship, so you gotta know your stuff. The following test should tell you exactly where you stand—simply check your answers against the correct answers at the bottom of each page, then score yourself according to the instructions on page 50. Good luck and Godspeed.

NOTE: To help put you in the proper geek mind-set, we've used the corporate colors of the McDonald's fast food franchise in the design of this feature.

1 Which chip boasts the most transistors?
a) Athlon XP
b) GeForce3
c) Pentium 4 Northwood
d) GeForce4 MX

2 What does nVidia call its driver pack?
a) nForce
b) GeForce
c) Detonator
d) TNT

3 Who owns the MP3 codec patent?
a) Fraunhofer
b) Microsoft
c) Sony
d) Real

4 Who is *not* a famous game developer?
a) Will Wright
b) J.C. Denton
c) Richard Garriott
d) American McGee

5 Which videocard never hit retail shelves?
a) Canopus Spectra 2500
b) Diamond Monster 3D
c) Voodoo5 6000
d) Elsa Gladiac

6 The bandwidth ceiling of USB 2.0 is:
a) 40MB/sec
b) 60MB/sec
c) 80MB/sec
d) 100MB/sec

7 The bandwidth ceiling of FireWire is:
a) 50MB/sec
b) 60MB/sec
c) 70MB/sec
d) 80MB/sec

8 Which of the following riser card solutions was developed and promoted by Intel?
a) PCM
b) ACR
c) CPR
d) CNR

Answers: 1-b, 2-c, 3-a, 4-b, 5-c, 6-b, 7-a, 8-d

9 **The spec called 802.11 is better known as:**
a) v.90 modem
b) CDPD
c) FireWire
d) Wi-Fi

10 **This is a picture of a:**
a) serial cable
b) floppy cable
c) IDE cable
d) Ultra160 SCSI cable

11 **Which RAID spec provides both mirroring and redundancy?**
a) 0
b) 1
c) 0 + 1
d) 0 - 1

12 **A digital camera with a 2.76-megapixel ceiling produces image sizes up to:**
a) 1280x1024
b) 1600x1200
c) 1920x1440
d) 2048x1536

13 **Which is *not* a playable compressed audio format?**
a) APE
b) CDA
c) OGG
d) RA

14 **Which represents a passive solution?**
a) water-cooler
b) Peltier cooler
c) fan
d) heatsink

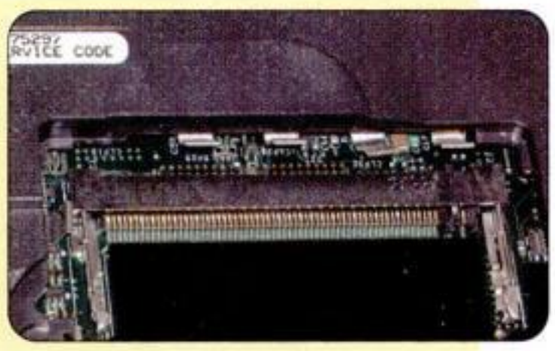
15 **What does a Z buffer do?**
a) helps calculate which pixels don't need to be rendered
b) cues up textures from system memory
c) dynamically adjusts texture size level
d) accelerates Z axis calculations

16 **Which game features BulletTime?**
a) *Hitman*
b) *Medal of Honor*
c) *Max Payne*
d) *Soldier of Fortune*

17 **What does LOD stand for?**
a) level of detail
b) load on demand
c) linear only deflection
d) Lords of Destruction

18 **Name the chipset that first introduced RDRAM to Intel desktop PCs:**
a) 815
b) 820
c) 830
d) 850

19 **Which CPU requires a specially designed case?**
a) Pentium
b) Pentium II
c) Pentium III
d) Pentium 4

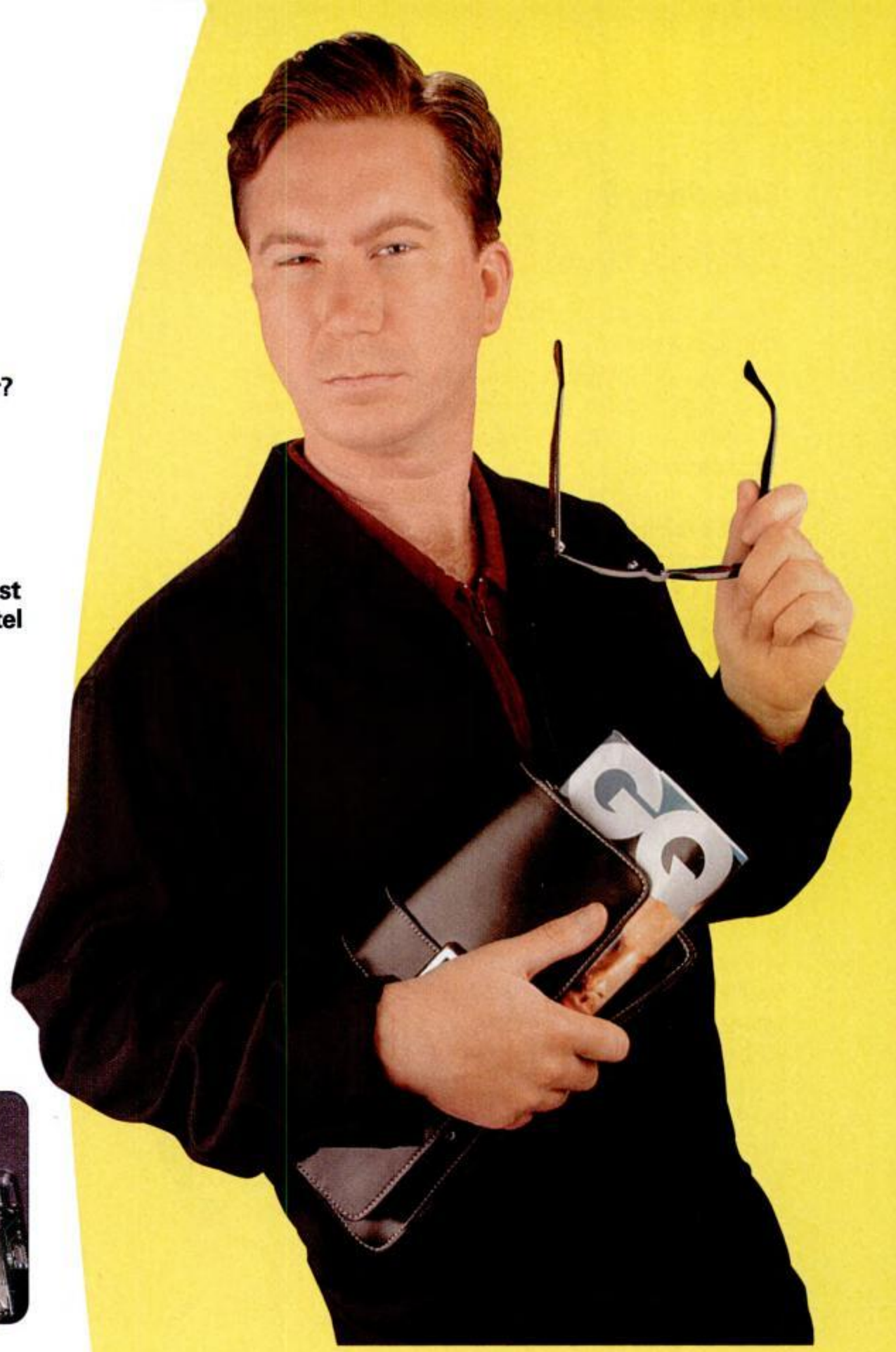


20 **This is a picture of a:**
a) memory slot
b) mini-PCI slot
c) FireWire Internal
d) USB Internal

21 **Which is *not* a current rewriteable standard?**
a) DVD-RW
b) DVD+RW
c) DVD-ROM
d) DVD-RAM

22 **Which company is *not* headquartered in Silicon Valley?**
a) Maxtor
b) ATI
c) nVidia
d) Rambus

23 **Which company developed the Xbox's graphics chip?**
a) nVidia
b) Intel
c) 3Dlabs
d) ATI



Case Study A

DELTA GEEK *Zero to 15 correct answers*

Favorite hardware vendor: Dolce & Gabbana

Favorite junk food: Seared fois gras with lingonberry jam on toast

Favorite sports team: Harvard Varsity Fencing Squad

Internet service provider: "Hee-hee. It said I've got mail"

Oh, Delta Geek, what a pathetic, technology-starved web we weave.

You aspire to coolness, but no matter how many high-fashion man-purses you carry, no matter how many articles you read about small-batch bourbon, no matter how many times you practice taking off your glasses to affectedly emphasize a point or simply announce to the world that "Hey, I'm a very special man who wears very special glasses," you *still* don't know your way around a PC and you *still* get schooled every time you play deathmatch with the guys in customer service.

But there is hope for you yet, Delta boy. You might trail Gamma, Beta, and Alpha Geek on the hierarchy of geek supremacy, but simply by purchasing this copy of *Maximum PC*, you've taken your first baby steps toward enlightenment. What's that? You say you answered only zero to 15 questions, but you look nothing like the twee lad in this profile? Then you're merely ignorant and not entirely annoying. Reset two jumpers and call us in the morning.

Answers: 9-d, 10-c, 11-c, 12-c, 13-b, 14-d, 15-a, 16-c, 17-a, 18-b, 19-d, 20-b, 21-c, 22-b, 23-a

Geek Test

Case Study B

GAMMA GEEK *16 to 30 correct answers*

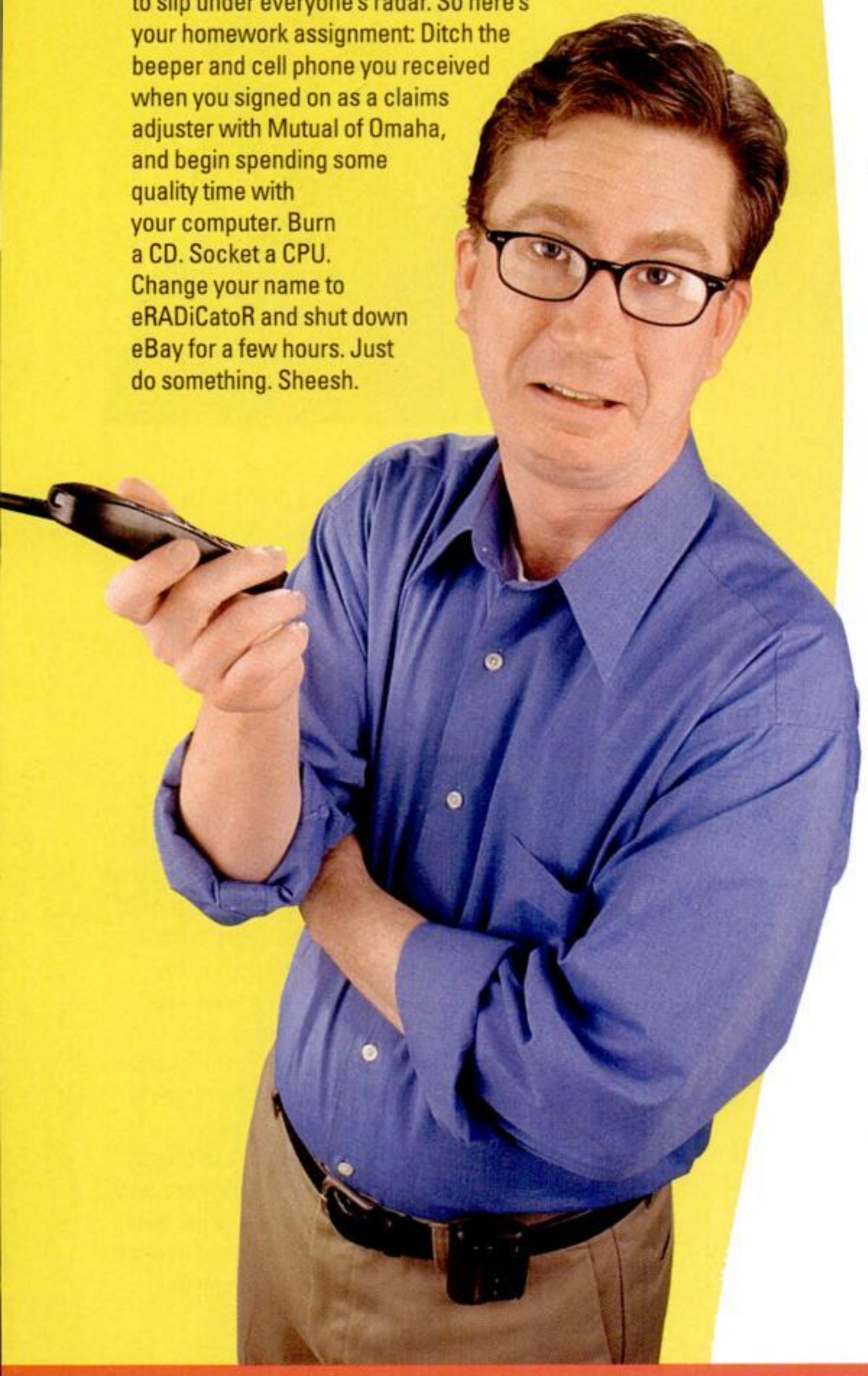
Favorite hardware vendor: "I don't care who made it, just as long as it works"
Favorite junk food: Unflavored, nonspecific grain cakes
Favorite sports team: "Whoever won the last Bud Bowl"
Internet service provider: "I don't care who runs it, just as long as it works"

Delta Geek might be an annoying putz, but at least he's got enough flair to stand out in a crowd. You, Mr. Gamma Geek, are about as distinguished as a can of chicken stock. Your clothes are mind-numbingly ordinary, your face is freakishly anonymous, and your combined personality mass falls somewhere between semi-translucent and nonexistent.

"Did Johnson come into work today?"

"Who's Johnson?"

The problem is that your intrinsic geek quotient—i.e., your ability to get excited about a hobby—is acutely underdeveloped. Yes, you correctly completed anywhere from 25 to 50 percent of a very difficult technology quiz, but even in your testing performance you were unspectacular; you know just enough about PCs to slip under everyone's radar. So here's your homework assignment: Ditch the beeper and cell phone you received when you signed on as a claims adjuster with Mutual of Omaha, and begin spending some quality time with your computer. Burn a CD. Socket a CPU. Change your name to eRADiCatoR and shut down eBay for a few hours. Just do something. Sheesh.



24 **Which is *not* a version of DOS?**
a) MS-DOS
b) DR-DOS
c) PC-DOS
d) ZD-DOS

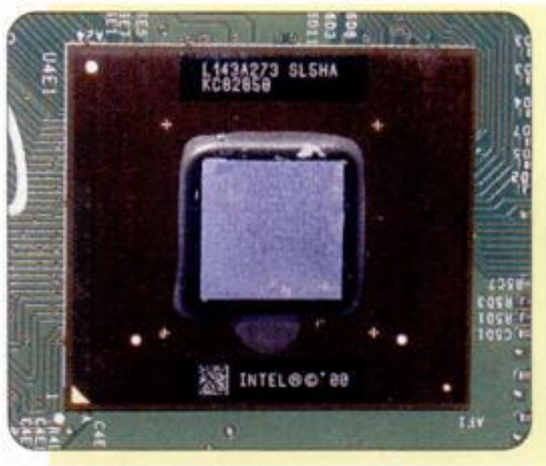
25 **What is a blog?**
a) one of the enemies in the upcoming *Unreal* sequel
b) an error caused by a video buffer overrun
c) an online diary
d) a 3D rendering technique that builds upon nurbs

26 **What is Gordon Moore most famous for?**
a) his law
b) his standards
c) his temper
d) his quixotic impulses

27 **What is the maximum addressable amount of memory in Windows XP Professional?**
a) 1GB
b) 1.2GB
c) 2GB
d) 4GB

28 **What is the maximum sound quality of the Sound Blaster Audigy?**
a) 16-bit/48KHz
b) 24-bit/48KHz
c) 16-bit/96KHz
d) 24-bit/96KHz

29 **At which frequency does the Athlon XP 2000 run?**
a) 1.53GHz
b) 1.67GHz
c) 1.73GHz
d) 2.0GHz



30 **This is a picture of a:**
a) CPU
b) 3D accelerator
c) memory module
d) northbridge chip

31 **Which company makes 4-in-1 drivers?**
a) nVidia
b) Intel
c) ATI
d) VIA

32 **Alex St. John is most often associated with the development of:**
a) *X-Wing Versus Tie-Fighter*
b) Xbox
c) DirectX
d) heartburn

33 **Who is the CEO of Microsoft?**
a) Bill Gates
b) Steve Balmer
c) Paul Allen
d) Steve Case

34 **What are the standard system bus/multiplier settings for a 2GHz Pentium 4?**
a) 100MHz/20x
b) 200MHz/10x
c) 333MHz/6x
d) 400MHz/5x

35 **What is the "performance rating" of a 433MHz Cyrix III CPU?**
a) PR433
b) PR500
c) PR533
d) PR600

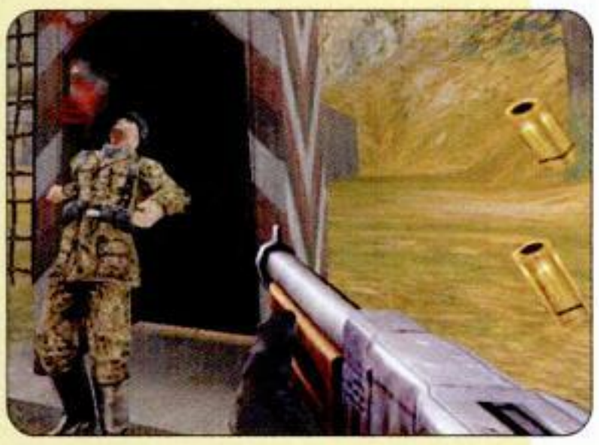
36 **How much L2 cache is in a Pentium 4 Northwood?**
a) 128K
b) 256K
c) 512K
d) 1MB

37 **Which company makes BIOSes?**
a) AMI
b) VIA
c) SiS
d) ALi

38 **What trick is used during some Athlon overclocking projects?**
a) pin trick
b) paperclip trick
c) bridge trick
d) pencil trick

Answers: 24-d, 25-c, 26-a, 27-d, 28-d, 29-b, 30-d, 31-d, 32-c, 33-b, 34-a, 35-c, 36-c, 37-a, 38-d

39 **What does the aforementioned trick affect?**
a) bus speed
b) multiplier
c) voltage
d) cache size



40 **This is a picture of a:**
a) Thompson machine gun
b) Mauser rifle
c) panzerfaust
d) snooper rifle

41 **The term areal density is used when describing:**
a) hard disks
b) PCB layouts
c) microchip substrates
d) 3D environments

42 **Which is *not* a standard memory spec?**
a) PC1600
b) PC2100
c) PC2400
d) PC2700

43 **What does the "XP" in Athlon XP stand for?**
a) extra performance
b) extreme performance
c) extremely powerful
d) experience

44 **Which battery technology is used in most modern notebooks?**
a) lithium-ion
b) nickel-cadmium
c) mercury-oxide
d) lead-acid

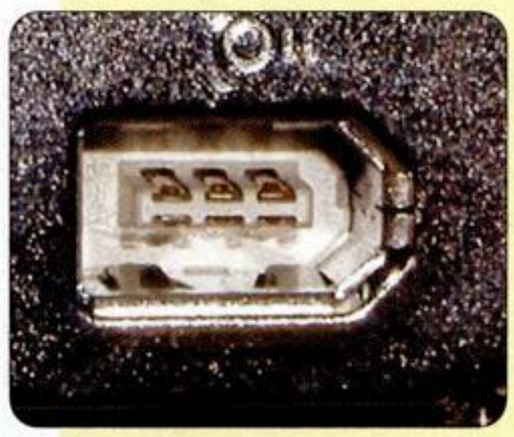
45 **Which company does *not* license the Palm OS?**
a) Handspring
b) Sony
c) Sharp
d) Hand Era

46 **What's the strongest encryption key allowed by U.S. law?**
a) 40-bit
b) 128-bit
c) unlimited
d) encryption is always illegal

47 **What was the code-name for the GeForce2 Ultra?**
a) NV10
b) NV16
c) NV20
d) Fireball

48 **What wireless standard operates in the 5GHz range?**
a) Bluetooth
b) 802.11a
c) 802.11b
d) 802.11g

49 **What does DLP stand for?**
a) digital laser projector
b) digital light processor
c) dual layer processing
d) dynamic lighting projector



50 **This is a picture of a:**
a) USB 2.0 interface
b) DVI interface
c) SP/DIF interface
d) FireWire interface

51 **USB mice update their position:**
a) 40 times a second
b) 60 times a second
c) 125 times a second
d) 256 times a second

52 **What OS does TiVo run on?**
a) Linux
b) BeOS
c) GeOS
d) Lindows

53 **What is the most popular arcade emulator?**
a) LAME
b) MIME
c) GIMP
d) MAME

Case Study C

BETA GEEK

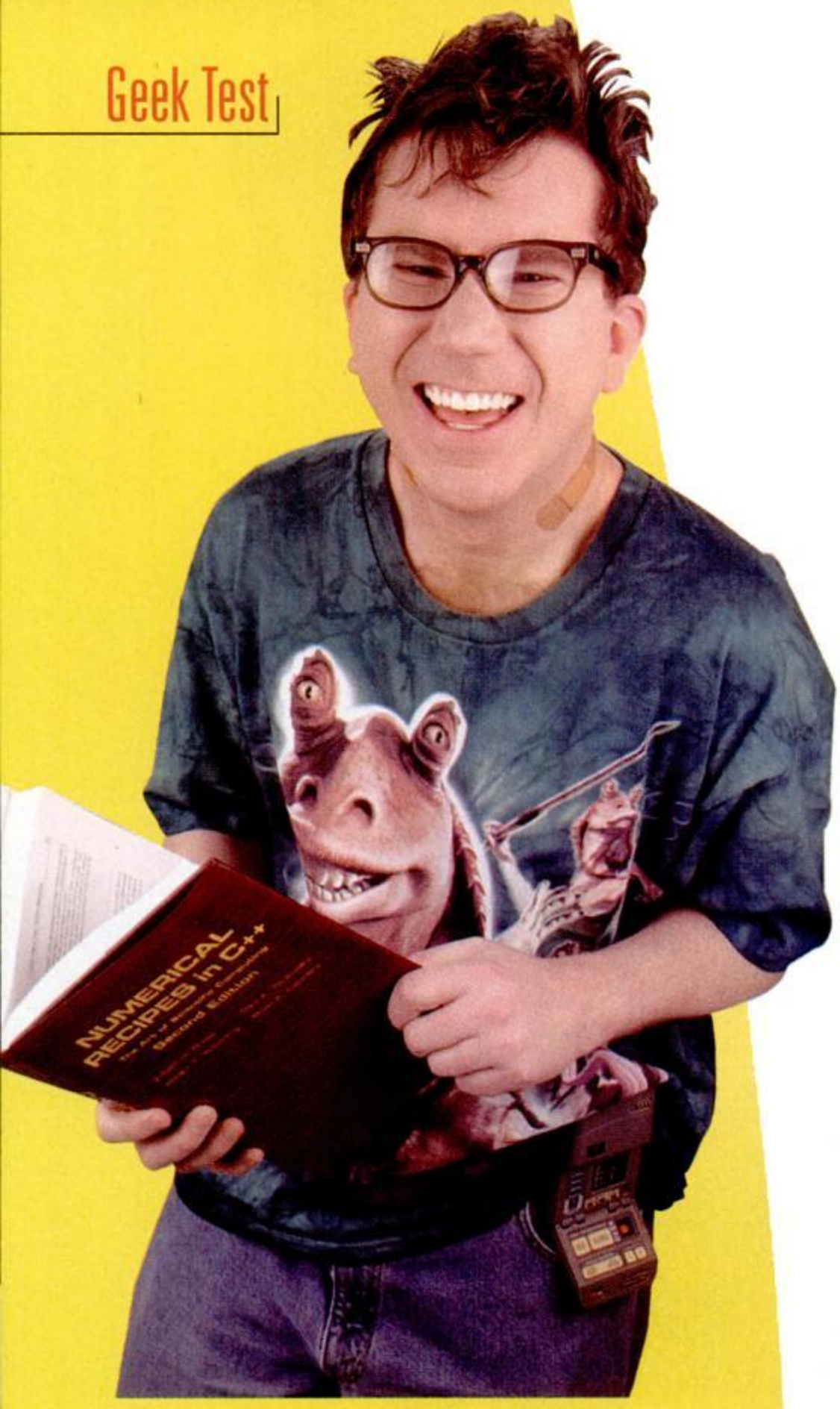
31 to 45 correct answers

Favorite hardware vendor: Edmund Scientific
Favorite junk food: "Pizza's not a junk food—it's a peripheral"
Favorite sports team: Springfield Atoms
Internet service provider: "I like to think that nearly every wired person in America has been my own personal 'Internet service provider' at one time or another, if you catch my drift"

Some would call Beta Geek the most well-rounded of our four case studies. Yes, he's extremely computer-literate—but he's also well-versed in highbrow Simpsonian culture. And, yes, he's relatively unkempt—but he does have a girlfriend, believe it or not, and together they make beautiful blog.

But what makes Beta Geek truly extraordinary is his ability to multitask among various passions: reading *Maximum PC,* programming apps for his PDA, eating pizza, overclocking his FSB, dreaming about what it's like to be a New Jersey waste management administrator ("Just imagine: waste management!")—all are within Beta Geek's grasp. Of course, there was that time when he attempted to hot-sync his pizza, but even the sharpest of PC studs have their moments of confusion.

Answers: 39-b, 40-a, 41-a, 42-c, 43-b, 44-a, 45-c, 46-c, 47-b, 48-b, 49-b, 50-d, 51-c, 52-a, 53-d



54 **What is the code-name for the Windows XP user interface?**
a) Luna
b) Aqua
c) Lambo
d) Cairo

55 **What law did Dimitry Skylarov allegedly violate?**
a) Patriot Act
b) RICO
c) Digital Millennium Copyright Act
d) Electronic Communication Privacy Act

56 **What game was changed in response to September 11th?**
a) *Command & Conquer: Red Alert*
b) *Microsoft Flight Simulator*
c) *Ghost Recon*
d) *Under Siege: Terror Hunt*

57 **What can *Powerstrip* help you do?**
a) overclock a CPU
b) overclock a videocard
c) turn off unused PC components
d) turn off unused CPU functions

58 **Which company developed the HyperTransport motherboard technology?**
a) AMD
b) Intel
c) VIA
d) Apple

59 **Which application would you use to edit an AVI file?**
a) *Premiere*
b) *Photoshop*
c) *Acrobat*
d) *Illustrator*

60 **Where would you likely find an RJ-45 jack?**
a) modem card
b) Ethernet card
c) soundcard
d) videocard

HOW TO SCORE YOURSELF

First, a disclaimer: This geek test was created by the *Maximum PC* brain trust during an hour-long staff meeting. Correct answers were later verified with the help of source material lying around our office. Every brain trust member knew the majority of the answers, but no single staffer knew *all* the answers.

OK, it's time to score this sucker. Give yourself one point for every question answered correctly, except for questions 25 and 35. Take away one point if you correctly answered number 25, because blogs are annoying and we think the world would be better off if no one knew about them. (If you answered number 25 incorrectly, don't give yourself a point—just take your goose egg and move on.) Now, if you correctly answered number 35, give yourself two points, because you're either incredibly geeky (c'mon who really keeps track of Cyrix performance ratings?) or probably the sorry owner of a 433MHz Cyrix II, which is sad and pathetic and deserving of what we shall call a charity point.

Now then, the test is worth 60 possible points. If you earned 0 to 15 points, you are a Delta Geek, the lowliest member of the geek pecking order. See page 47 for a glimpse into the unfathomable ignorance of your spiritless soul. If you scored between 16 and 30 points, you are a Gamma Geek, the third-place winner in a four-geek contest. If you can stand looking in the mirror for a few seconds, see the profile on page 48. You'll learn more about yourself than you ever cared to know.

Scoring between 31 and 45 points puts you firmly in Beta Geek territory, which is fancy real estate indeed and just one step away from geek supremacy. Refer to the profile on page 49 for all the idiosyncratic details that make you so damn special. Finally, if you scored between 46 and 60 points, you are Alpha Geek—the top dog, the big cheese, www-I'm-the-shiznit-dot-com. For a closer look at your bad self, see the profile on this page. And watch your back: As Alpha Geek, you have to defend yourself against the scurvy-dog Beta Geeks nipping at your heals. ■

Case Study D

ALPHA GEEK

46 to 60 correct answers

Favorite hardware vendor: "SuperSiliCo—they processed the raw material that went into the chip that went into the box that I used last night in *Counter-Strike* to kick your EVERLOVING FRAG-PRONE ASS!"
Favorite junk food: Klingon blood pie
Favorite sports team: Big Blue
Internet service provider: Has no need for conventional service providers. Simply splices himself into the nearest T3 line whenever he needs an intravenous data feed.

An excitable boy by nature, Alpha Geek is prone to fits of uncontrollable, deafening laughter. Like some kind of reptilian man-thing, his lower jaw disengages from his skull, and from the deep recesses of his diaphragm he emits a cackle that sends poisonous plaque-spit and honey-barbecue shock waves throughout all four corners of his digital domain.

Still, you have to love Alpha Geek because he's so shamelessly comfortable with his own awkward foibles. His strength, of course, comes from his unstoppable PC dominance. You answer a PC troubleshooting question correctly, and he'll one-up you by answering the same question—in binary. This may not score a lot of points in human society, but it keeps Alpha Geek at the front of the man-machine pack.

Answers: 54-a, 55-c, 56-b, 57-b, 58-a, 59-a, 60-b

POLYWELL

POLY SYSTEMS

Thinking outside the box...

The Ultimate PC Workstations For Gaming and Developers!

POLY 880NF nForce

AMD Athlon™ XP Processor 2000+
with QuantiSpeed™ architecture*
outperforms competitive 2.0GHz processors
512MB DDR memory (Exp. to 2GB)
80G ATA-133 7200RPM Hard Drive
40x24x10x CDRW, 16x DVD-ROM
Nvidia GeForce4 64MB AGP Graphics
19" High-Res.26mm Graphics Monitor
Pinnacle System Studio DV 7 Video Editing
Cambridge Subwoofer Speakers
56K Modem, 100bit LAN, 1394 Firewire
MS® Windows® XP Home Edition
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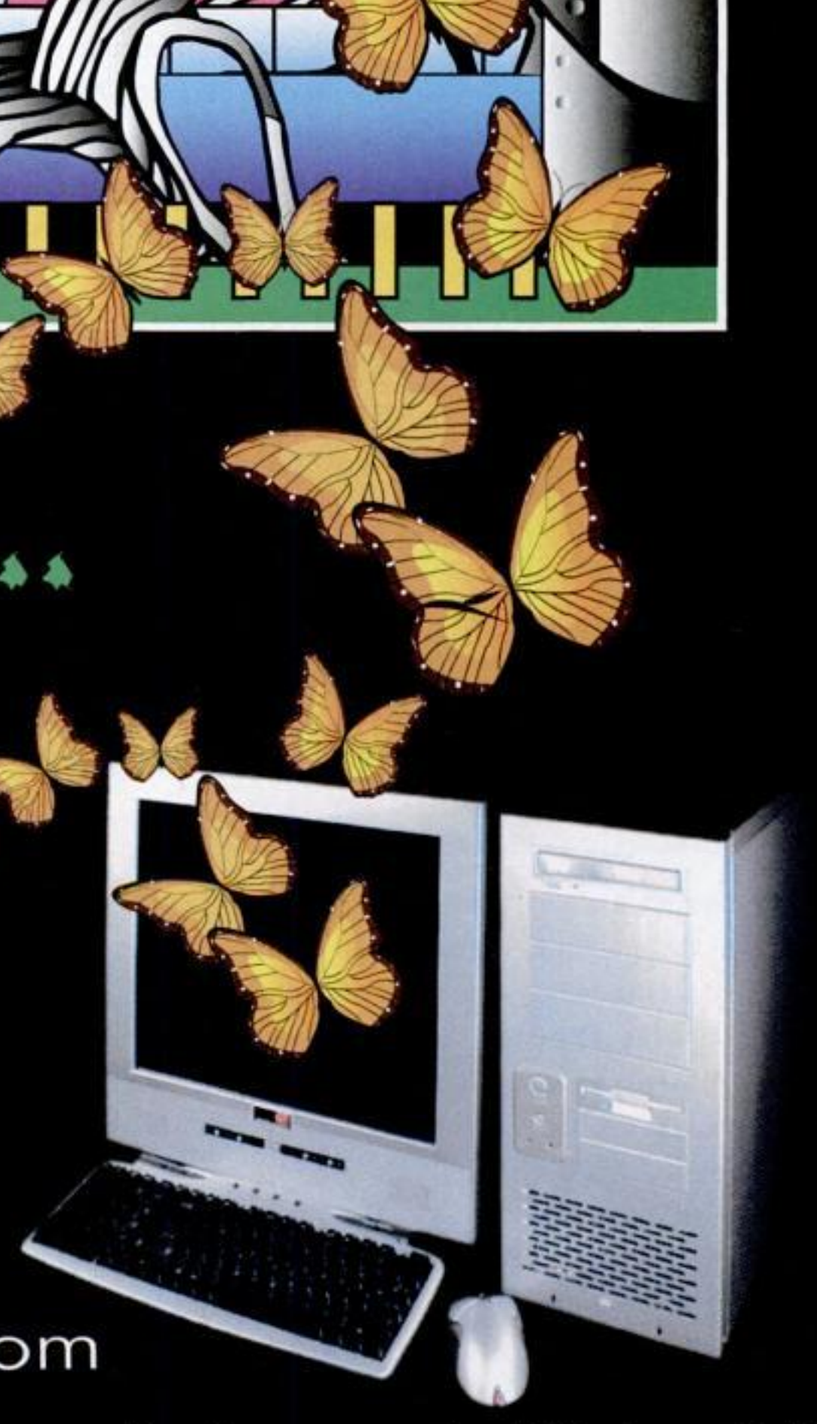

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Ask the Doctor

Symptom → Diagnosis → Cure

Have a burning PC problem? How about a burning PC sensation? We're more than happy to help you with your PC problems, but you might want to get that sensation thing checked out by a qualified sensation checker-outer. If you have PC questions, send them to **doctor@maximumpc.com**. Just remember: We can't answer every e-mail. Oh, *no*—not by a long shot.

Questions a Go-Go

I'm new to the PC scene and have some questions about stuff I've read in your mag. First, what is RAID? I know that it's a PCI card that does something to the hard drive and that it's hard to use a RAID hard drive setup with your OS on the RAID drive.

"We frequently test motherboards sans case in the Lab, but we'd never dream of running one for an extended period of time without a case."

RAID really is not that hard to do, but if you must ask what it is, you probably don't need it and should avoid it on your first PC project. Once you're comfortable with your PC, you can learn more about RAID and its uses from our October 2000 feature dedicated to the subject.

Will a normal mobo support as many as 10 fans, or is another part needed?

A fanbus is a device that lets you turn internal fans on or off as needed. After all, you don't need mondo cooling when your PC's hibernating.

Most desktop motherboards do not support powering and controlling more than four or five fans. You can, however, run additional fans off the standard four-pin power connectors that plug into your hard drive and optical drives, but those fans would not be regulated or monitored by the motherboard.

Is it worth getting a part that will turn fans on and off? Would it be hard to install?

The device you're looking for is called a fanbus. The fans that run off the three-pin motherboard headers will shut off automatically when the PC hibernates or sleeps and can be monitored by the PC. By using a fanbus, you can get the same functionality from all the fans your motherboard doesn't support. And no, it's not too hard to install.

Does it matter if you install a powerful/high-watt power supply, or does the PC not even use the extra power?

If you have a PC that generally uses 150 watts of power and you have a 500 watt power supply, your PC will not use all 500 watts unnecessarily, but it will take advantage of the extra wattage when needed. It's better to have a larger power supply that's not being used all the time than to have a smaller power supply that's under a full load at all times.

What should I do if the DVD player/software on my laptop won't let me change regions?

If the DVD drive is region-locked in firmware, you'll need to find a DVD region-hacking program to alter the situation. This is somewhat risky as it requires flashing the DVD-ROM drive, which could kill it. It's also possible the software is simply locked because you played five or more Region 1 DVDs. Elaborate Bytes (www.elby.org) has a program called *DVD Region Killer 2* that will let you bypass region codes under certain circumstances, and best of all, it's free.

Do cases that are left open for long periods experience problems like dust and static?

Yes and no. Static electricity is a problem with any case, whether or not the side is left open. An open case is more susceptible to contamination from dust or stray crumbs from your lunch than is a case that's shut and features a dust shield.

Thank you for answering my questions!

—HUGH

The Problem with Pop-Ups

I've been experiencing some problems with pop-ups lately. Something on my computer is causing pop-ups to open when I go to sites such as **www.ebay.com**, **www.microsoft.com**, and **www.amazon.com**. The pop-up ads that appear when I go to these relatively popular sites have nothing to do with the sites I'm visiting; they're ads for cell phones, travel plans, etc. The pop-ups always appear in the bottom right-hand corner of my screen.

Did I install some sort of ad pop-up software? Is there a way to get rid of these annoying things? Please help me, Doctor!

—JOE McCARTHY

Welcome to the new age of Internet advertising, Joe. These strange ads aren't the hellspawn of a malicious piece of software; they're just the latest advertising tactic foisted upon the web-browsing public. Because ad revenue has not been forthcoming from the traditional banner ads, Internet advertisers have resorted to pop-up and, even trickier, pop-*under* ads to catch the buying public's eye.

Whereas the original pop-up ad grabs attention from your browser window by jumping to the forefront of your desktop, pop-under ads appear behind your browser window, leaving you alone until you close the browser window only to find a slew of ads featuring scantily clad women hawking, say, "baby monitor" cameras.

To get rid of the pop-ups and pop-unders, head to www.panicware.com and download *Pop-Up Stopper*. The free version is more than sufficient for day-to-day pop-up extermination, but a more advanced version that offers a few more features is available for $20.

I Want My VCD!

I've been trying to make video CDs that will play in my DVD player. My DVD player is capable of reading CD-R, and I've encoded a small, five-minute film. I have a lot of tapes, trailers, and movies stored on my computer, but can't find a good program to encode them. I have used video impressions from Roxio E*asy CD Creator*, a Xing encoder, Adobe *Premiere*, and several shareware programs. Roxio seems to be the best, but it locks up half the time, and all the other programs elicit errors or locks ups. Any advice or help would be greatly appreciated.

—SHAWN WEBSTER

You could have one of two problems. We'll assume you're using the latest versions of all the applicable software, have current drivers and DirectX installed, and aren't running

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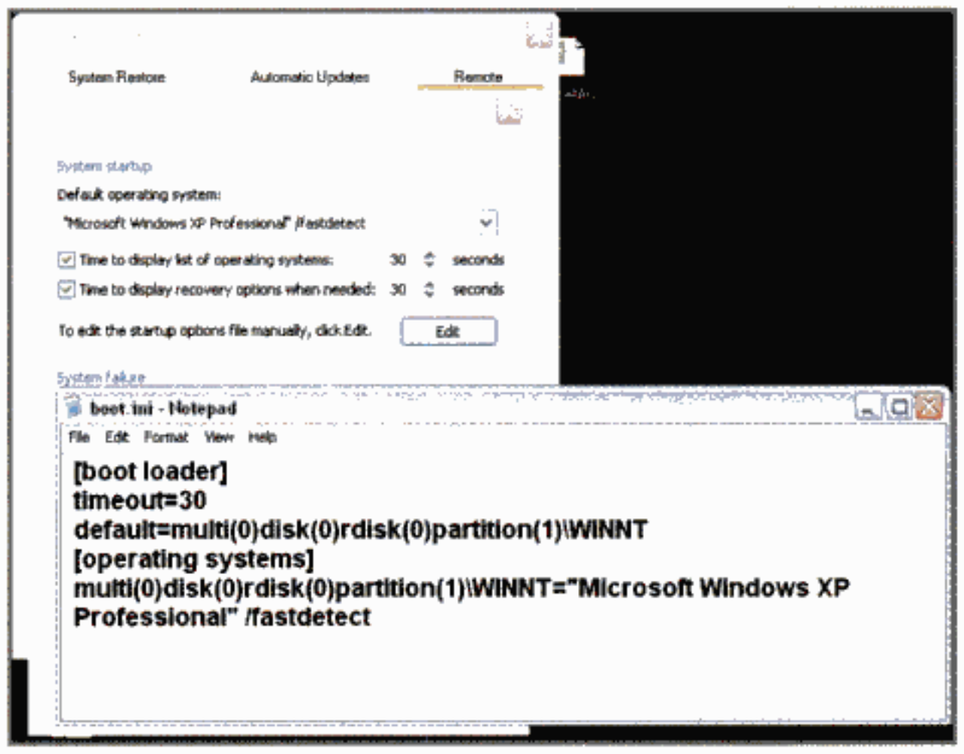
Changing this little text file changes the options you see on Windows XP's boot loader. This is a boot.ini file from a Windows XP Pro box that boots off the first partition of the only IDE drive in the system.



an archaic OS like Windows 95. We can rule out a bad encoder because you tried using multiple products to get the MPEG-1 stream that the video CD spec requires. We'd bet that your system is crashing during the encode because the CPU is overheating.

Compressing video is one of the most CPU-intensive things you can do with a PC; and compressing a lengthy video file could work your processor harder than it's ever worked before. First, make sure the CPU's heatsink is mounted on the CPU and that some sort of thermal compound has been applied to the CPU. Make sure the CPU fan and any other fans in the general vicinity of the CPU are actually working. Finally, check the air intake at the front of the PC for any blockage or a possible dead fan.

If you're still having problems after double-checking the cooling, try encoding your raw video on a friend's PC. If his computer exhibits the same symptoms, your original source files may be the culprit and require re-capturing.

What's the Matter with My Monitor?

I have a Dell P-III 866 with an nVidia TNT2 M64 videocard. I was playing *Unreal Tournament* on a Dell M781 17-inch CRT. The graphics and performance were fine (at least for me) until I switched to an NEC Multisync 1830 LCD monitor. On the new monitor, game performance sucks! It's choppy and rough. What can I do to improve the game on my LCD? Or should I buy another graphics card and run two monitors—CRT for games and LCD for everything else?

—JEFF PETTER

Well, Jeff, you're not the first person who's been bitten on the ass by the limitations of LCD panels. Although the Multisync 1830 is among our favorite flat panels, it still has the same basic problem as any other flat panel. It supports only one resolution, which is called the display's "native mode." For the Multisync 1830, that resolution is 1280x1024, and it's at this resolution that games will look their best. Unfortunately, your videocard isn't powerful enough to give you decent frame rates at the native resolution. You can either play your games at a lower resolution and let the display's internal hardware interpolate up to the native resolution, or crank up the resolution and suffer through choppy frame rates.

The downside to interpolating a lower resolution up to your LCD panel's native resolution is that your game may look less sharp. What's the alternative? Grab a card that's able to produce 3D at your display's native resolution. Most GeForce3 boards are more than capable of running at 1280x1024.

Fork + Electrical Socket = ?

I have a Dell P-III 500MHz using an Intel motherboard. I want to purchase a 1.1GHz Celeron (128KB L2 cache) and pop it in there. Does this create a voltage problem? Should this work with a Slot 1 adapter?

—DAVE

Dave, this may or may not work, but you will likely have a voltage problem because the Katmai version of the P-III has a higher core voltage than the Celeron. In actuality, there are two versions of the 1.1GHz Celeron. The first uses the 0.18-micron process technology, has 128KB of L2 cache, and uses a core voltage of 1.75V. The second version (the Celeron 1.1A) is based on the 0.13-micron process technology, has 256KB of L2 cache, and uses a core voltage of 1.475V. If the motherboard in your Dell won't jack down to a lower voltage level, you'll either immediately fry the CPU or possibly get weeks, months, or even years out of it before it dies. Granted, the risks are greater with the lower voltage Celeron 1.1A, but either way consider yourself warned.

Hot or Cold?

My question to you is this: We all know that heat is a big problem for high-performance PCs if they are not properly cooled. However, what are the proper running temperatures for our computer systems? We all know that the cooler the better, but what temperatures are considered normal, dangerous, and too hot? Can you get too cold?

—JON MARTIN

The proper internal temperature varies depending on what type of CPU, 3D accelerator, and even hard drives you have in your PC. You can find recommended operating temperatures for each component on the manufacturers' web sites; however, there are some general guidelines you can follow. The absolute hottest temperature you want to see anywhere inside your case is around 110°F or 44°C. Running anything above that temperature for extended periods may shorten the life of your hardware.

Don't rely on the built-in thermistors on your motherboard. Go down to Radio Shack and pick up a thermometer with a wired probe that you can use to measure different areas inside your PC. Typical hot spots are near the CPU and system RAM, the 3D accelerator, and the hard drives.

As for getting too cold, we have never had any problems with super-cooled systems. The only real concern with too much cooling is condensation. If you have pipes or other objects inside your PC that are cold, water can condense on them. Water inside your case is never, ever a good thing. Of course, in order to get condensation, your cooling mechanism needs to get near freezing.

Botched Boot Time

Whenever I start my computer, I'm asked to choose which operating system I would like to run. Both choices are Windows XP Pro, but one is from a failed installation that doesn't work. I would like to get rid of the failed installation or just run the good one by default instead of always choosing which one I'd like to run. Please help me!

—BRYAN ANDREWS

"... you will likely have a voltage problem because the Katmai version of the P-III has a higher core voltage than the Celeron."

Changing your boot options in Windows XP is super easy. You can change the options by editing the boot.ini file on your C: drive, or by going to the System Properties Control Panel, then the Advanced tab, then the Startup and Recovery button. Your first option will be to change the amount of time that XP displays the startup menu, but we recommend just editing the file. Press the Edit button, then look under the [operating systems] section. The lines that start with multi(0)disk(0)... are the ones that control what shows up in the boot menu, and should be in the same order that they are when you are at the selection screen. Simply delete the one that *doesn't* work, and you should be good to go. ■

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How To...

A step-by-step guide to tweaking your PC Experience

MAKE YOUR OWN CUSTOM SCREENSAVER

—ERIC SEBELLIN AND S.J. ROSS

9 easy steps toward adorning your desktop with a personalized screensaver in less than a half-hour.

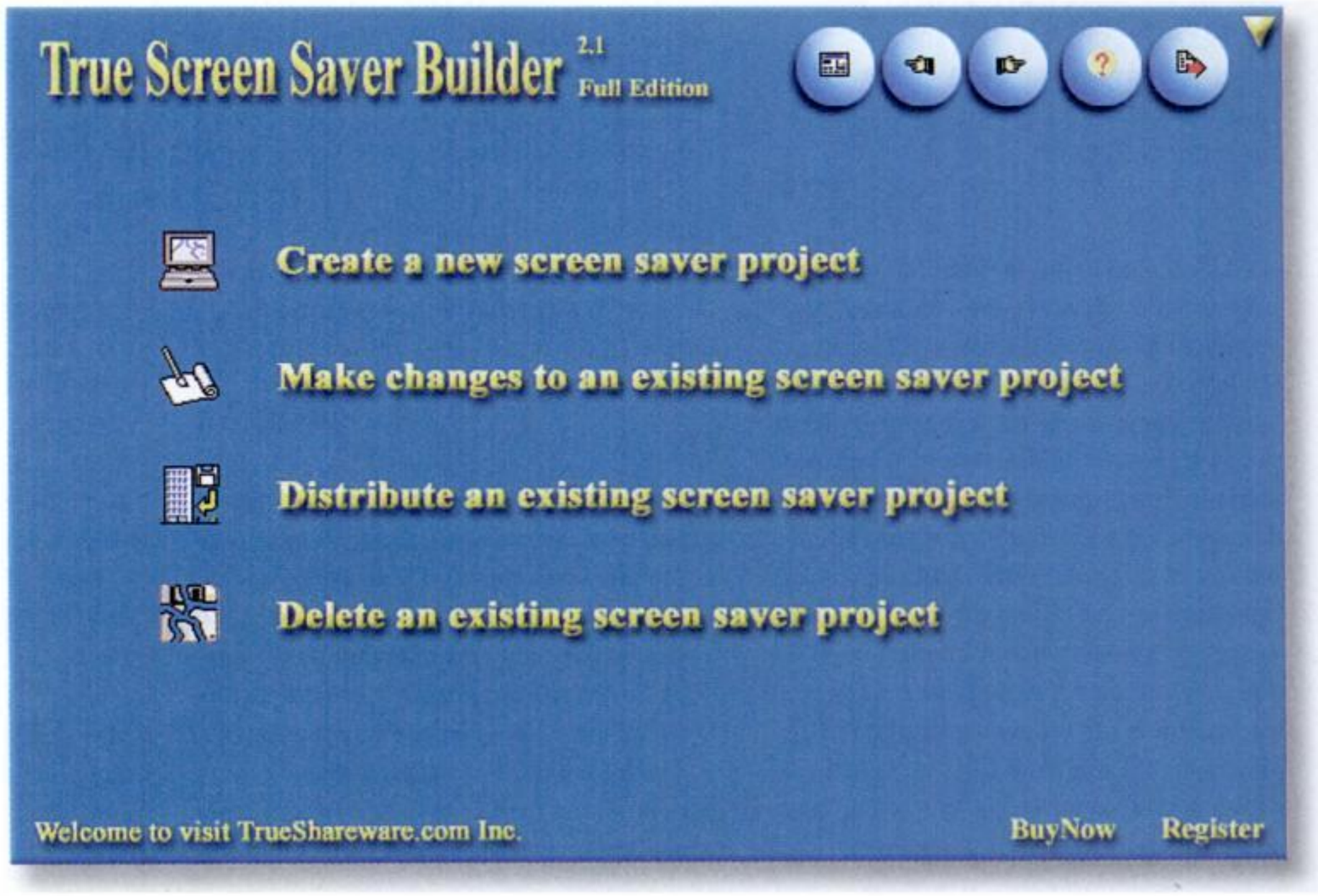
Back in the days when computing was fraught with danger at every turn, the phosphors on the inside of CRT monitors were prone to burn-in if the same image was displayed for an extended period of time. Burn-in essentially created a permanent ghost image on the computer screen. To combat the dread disease, some wise pioneer created the "screensaver," a program that displays moving content onscreen whenever a computer is left idle for a few minutes. No static image, no burn-in—disaster averted.

MAXIMUMPC TIME OF COMPLETION 00:29 HOURS MINUTES

Modern monitors aren't prone to burn-in, but screensavers persist. Why? Because they're fun! And they go a long way toward personalizing a desktop. In this article, we'll show you how to create your own screensaver, complete with changing images and transitions. So grab some images for your screensaver—it doesn't matter if they're your company's logos, pictures of your dog Sparky, or clip art you grabbed from the web—and let's get started.

WHAT YOU'LL NEED

- *True Screen Saver Builder* (www.trueshareware.com, $25)
- *Winzip* (www.winzip.com, $29)
- Images (we grabbed some cool clip art from Ronandjoe.com for $35)
- Image editing software, such as Adobe *Photoshop* or any of the less expensive alternatives


True Screen Saver Builder 2.1 Full Edition
Create a new screen saver project
Make changes to an existing screen saver project
Distribute an existing screen saver project
Delete an existing screen saver project
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1 1-2-3 Go

Once you've downloaded and installed *True Screen Saver Builder*, open the app and select "Create a new screen saver project." Then click the next-step button—the natty little hand pointing to the right—and prepare yourself for the next step. Please note, you must click this button whenever you wish to advance to the next major tab.

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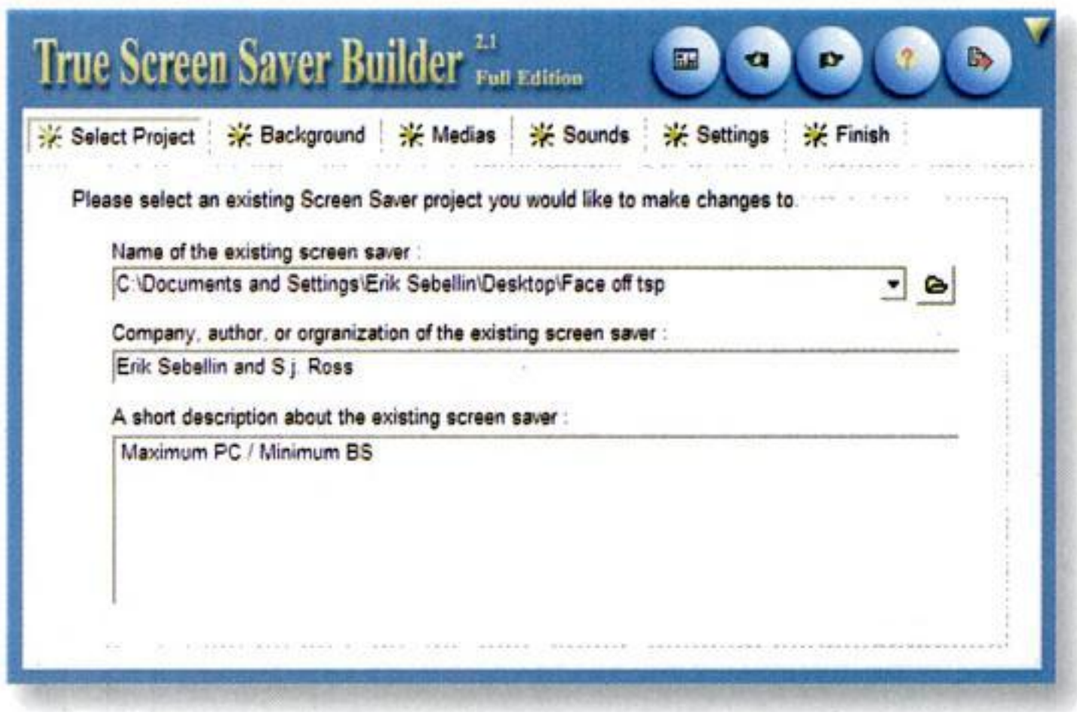
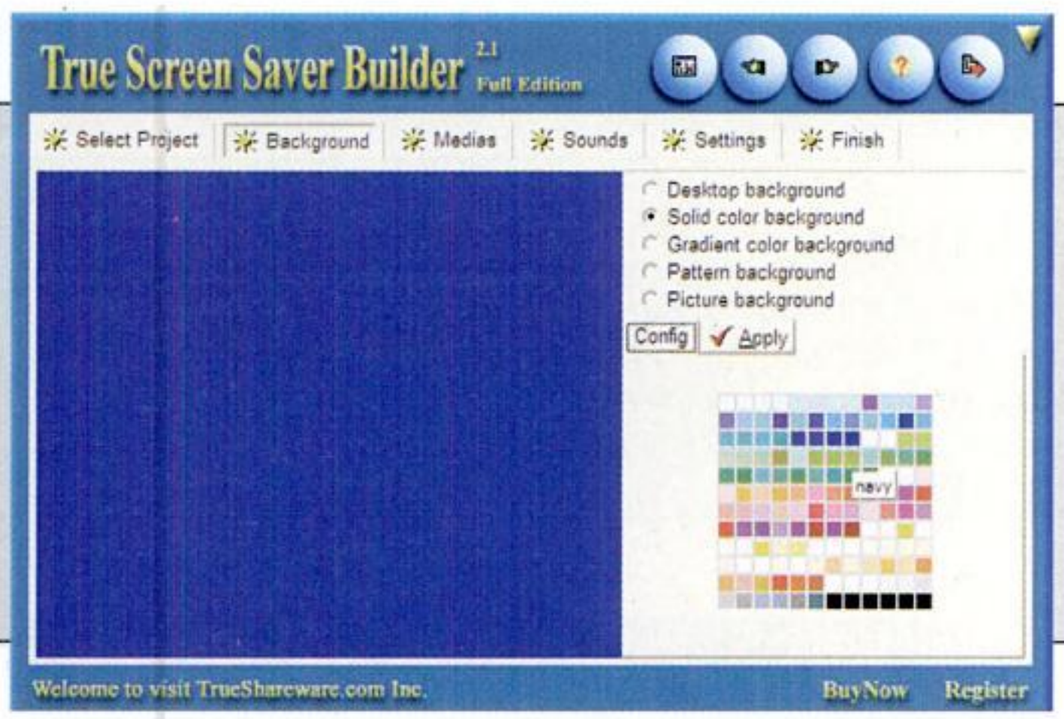
2 Just the Facts, Ma'am

Enter your screensaver name, the name of the screensaver author, and a description of your screensaver. Be aware that the screensaver name you enter is the name people will see in the screensaver menu, so if you distribute your creation, you may want to curb a wicked sense of humor.


True Screen Saver Builder 2.1 Full Edition
Select Project
Background
Medias
Sounds
Settings
Finish
Please select an existing Screen Saver project you would like to make changes to.
Name of the existing screen saver :
C:\Documents and Settings\Erik Sebellin\Desktop\Face off tsp
Company, author, or orgranization of the existing screen saver :
Erik Sebellin and S j. Ross
A short description about the existing screen saver :
Maximum PC / Minimum BS



3 Background Check

Next choose your background. We picked "Solid Color Background," but there are options for gradients, patterns, and pictures. Pick a color from the palette, and get ready to move to the next step. We selected the "Navy" color swatch. After you select your color, click "Apply."

4 The Medium Is the Message

We used five files from the Faces collection of the wonderfully whimsical Art Parts clip-art library (www.ronandjoe.com) instead of creating art ourselves. After using image editing software to add a matching background color to the clip art, we clicked "Add Media Files." Then we tweaked each of our five files.

First, you'll probably want to remove the captions, which default to the file names. Select the Caption tab, delete the caption and hit "Apply." Second, we centered the images by clicking the Position tab and choosing "Center." Third, we selected the Effects tab and selected transition number 20 for both the "Transition In" and the "Transition Out." Fourth, we selected the Misc tab and entered "2" to denote the number of seconds for each image transition interval.

5 Sounds Good

We debated adding audio, and decided against it: Looped audio can be incredibly irritating, and hey, we certainly don't want to announce we're not working to the guy at the next desk. However, if you wish to add audio to your screensaver, click "Add sound files" and select your preferred settings.

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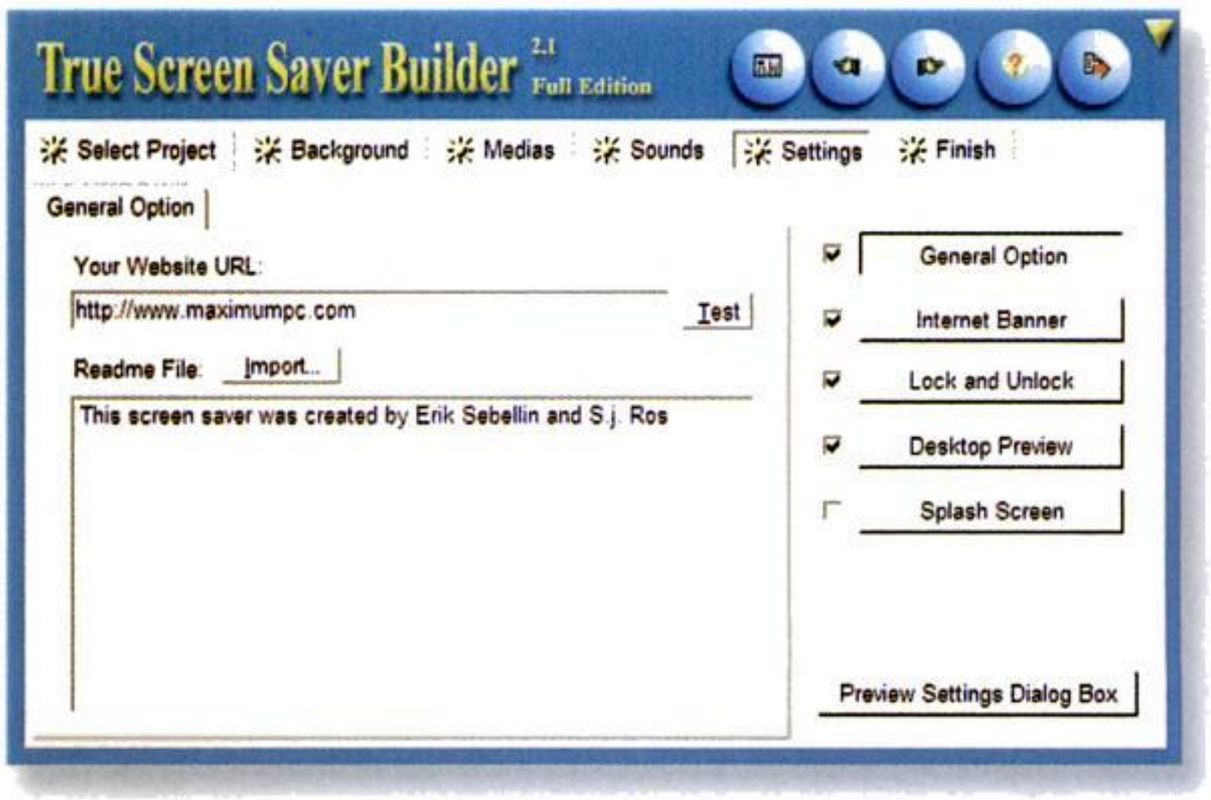
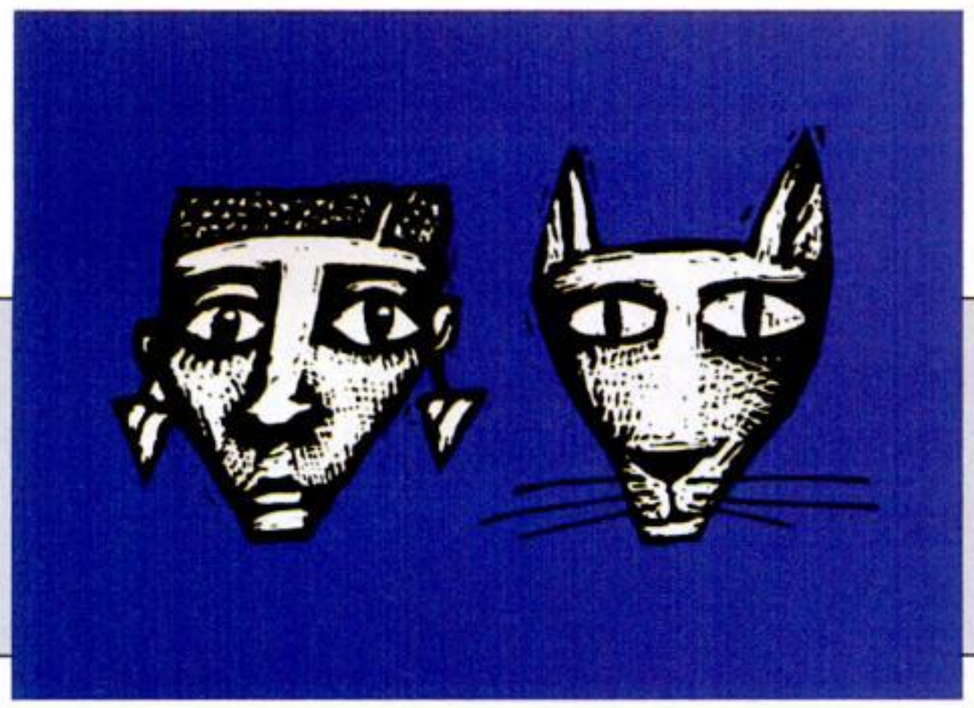
6 Setup

We're entering the home stretch. Fill in your web site's URL and readme file (if you so desire) in the appropriate spots. We also unchecked "Splash screen" to disable the *True Screen Saver Builder* logo, which annoyed us.



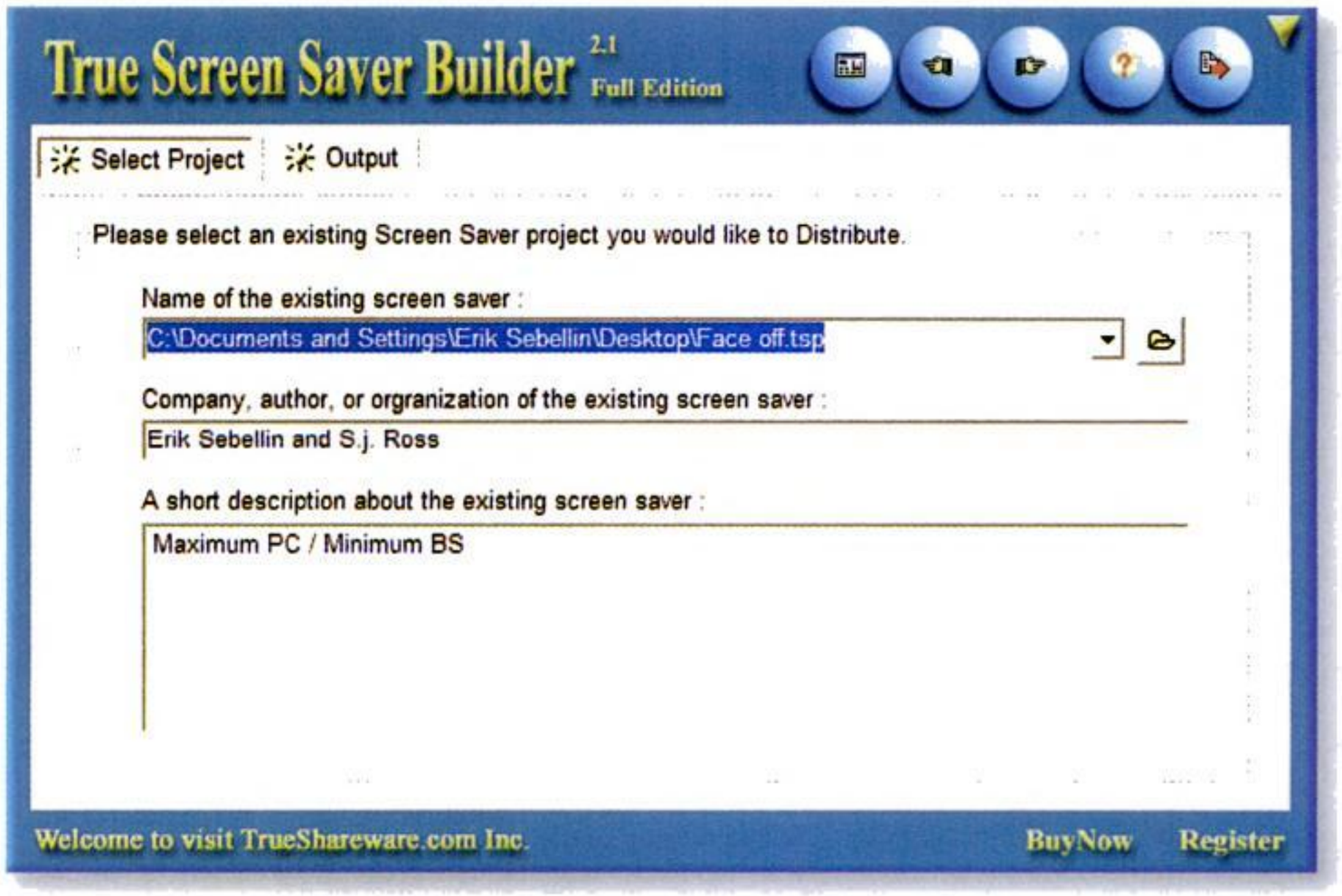


7 Finish Line

Click "Preview" to take a test run of your finished work. If you want to make any final tweaks, you can still go back and make changes. Once you're satisfied, click "Finish."

8 What Goes Around Comes Around

Look familiar? It should: We're back at the very first screen. This time, however, click "Distribute an existing screen saver project." A pop-up screen will appear. Select your file from the drop down list.


True Screen Saver Builder 2.1 Full Edition
Select Project
Output
Please select an existing Screen Saver project you would like to Distribute.
Name of the existing screen saver :
C:\Documents and Settings\Erik Sebellin\Desktop\Face off.tsp
Company, author, or orgranization of the existing screen saver :
Erik Sebellin and S.j. Ross
A short description about the existing screen saver :
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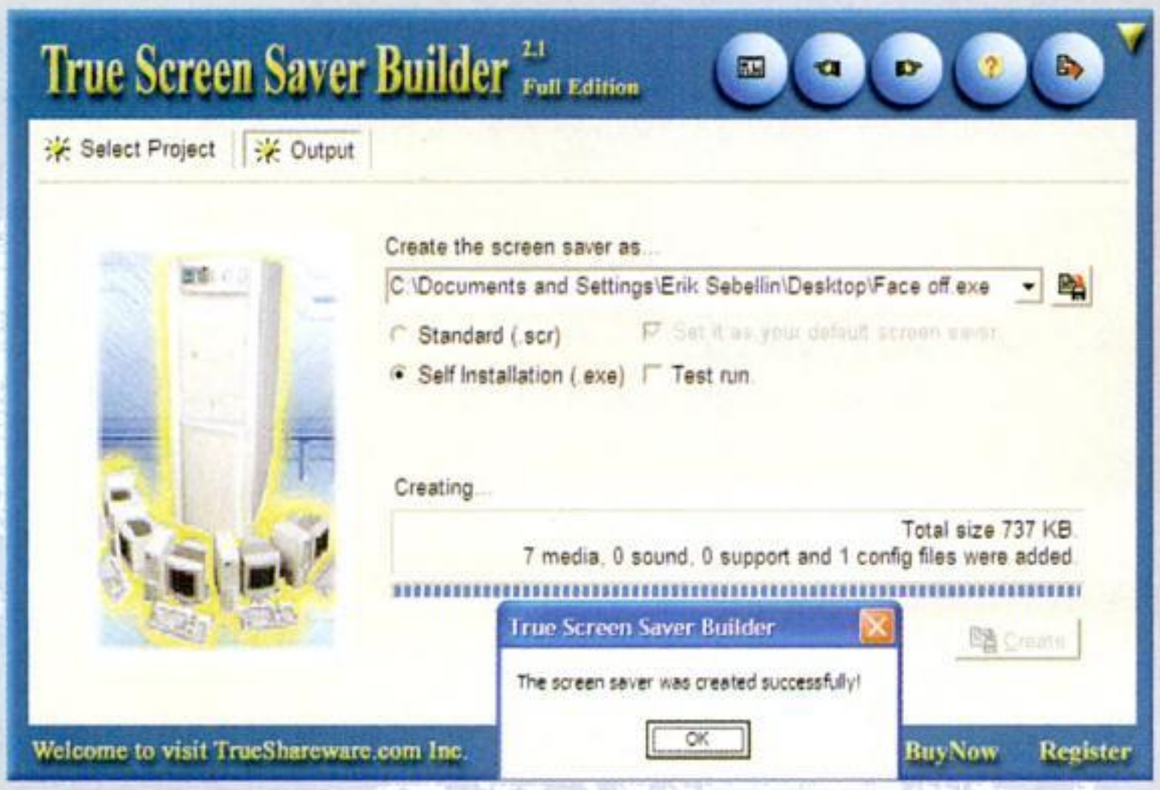

9 Run, Forrest, Run

To run your screensaver, click "Self Installation (.exe)," unclick "Test Run," and click "Create." Double click the icon that appears on your desktop and select "Install." You'll need to set your properties in Windows' Display Properties Control Panel to fully enjoy your handiwork.

More, More, More

For more information and resources, your easiest option is to search the Internet. For example, Macromedia has a tech note on its support site that explains how to create a screensaver from a Flash animation (www.macromedia.com/support/flash/ts/documents/screensavers.htm). Budding programmers can use *Visual Basic* to create more advanced screensavers as well. Search Google.com for "visual basic screensaver how-to" and you should find several useful sites. ■

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In the Lab

A behind-the-scenes look at Maximum PC testing

Behind the Benchmarks

BAPCo updates the applications and workloads in *SYSmark2002* for even *more* real-world results

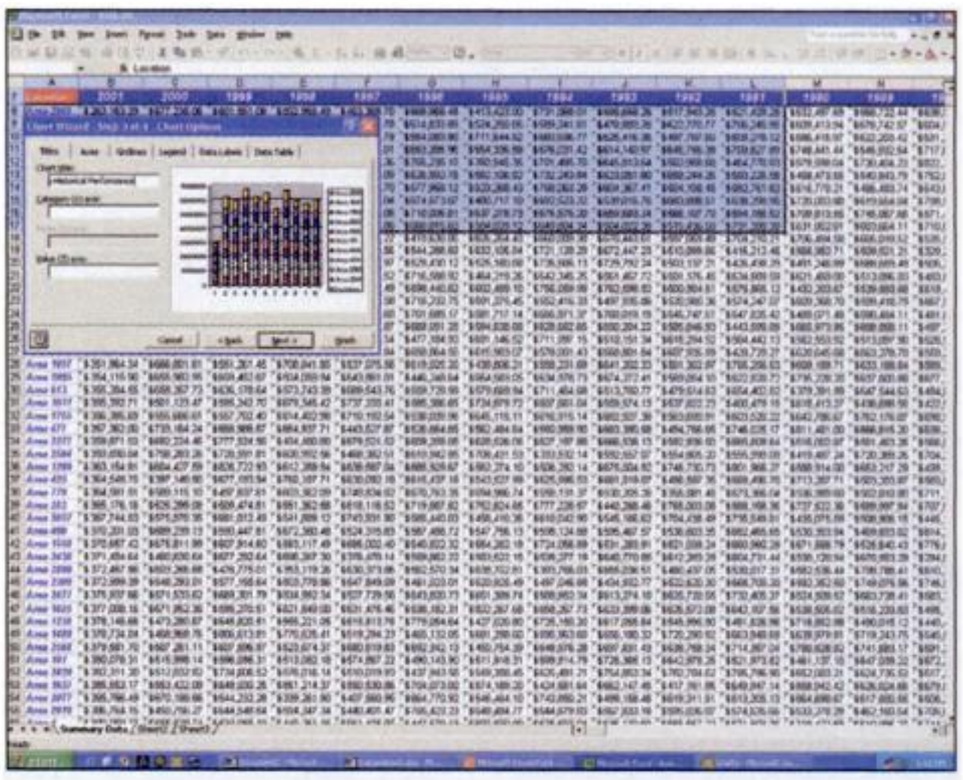
A "real-world" benchmark is only truly valuable if it represents what real users actually do with their own desktop PCs. An old-school "real-world" benchmark might simply load a single program such as *Word 97* and time how long it takes to enter and manipulate text. Unfortunately, a test like this doesn't simulate how a real person uses the program. Normal folks, for example, can't type 400 words per minute. And when they're typing, they're usually also multitasking in other applications.

All of which leads us to *SYSmark2002*, a 14-app benchmarking suite that updates the legacy that its *SYSmark* predecessors pioneered. The latest *SYSmark* suite runs applications at normal speed, multitasks across different applications, enters data at a human pace, and measures only the time it takes for the programs to respond. Like past versions, it spits out a final score to represent a PC's overall performance. We plan to ditch *SYSmark2001* for the new version when we update our official benchmarks this summer.

"SYSmark2002 uses the latest version of Windows Media Encoder—the one that properly supports the Athlon XP."

To the casual observer, the new suite doesn't look that different from the previous version. For example, it still divides its apps into Internet Content Generation and Office Productivity, and provides sub-scores for each category. Underneath, however, BAPCo has made quite a few changes. *SYSmark2002* uses the latest version of *Windows Media Encoder*—the one that properly supports the Athlon XP. This is sure to please the AMD crowd. When the Athlon XP was released and AMD discovered that *Windows Media Encoder* didn't properly address the CPU's SSE instructions, AMD cried foul.

The new suite also uses the 6.0.1 version of Adobe *Photoshop*. The prior release of *Photoshop* was handcuffed when running on x86 CPUs; that's why Apple likes to use the 6.0 version in its tests. BAPCo also updated the office productivity portion of its suite from *Office 2000* to *Office XP* and integrated a command-line mode and screenshot mode for capturing errors that occur.



The new *SYSmark2002* uses huge spreadsheets to test the speed of PCs.

As of press time, BAPCo hadn't yet released the full details of the changes it made to scripts or workloads, but we were able to glean a few details from our interviews with the developers. For starters, *SYSmark2002* adds a gaggle of image files to the *Outlook* mailbox and instructs the program to compress the mailbox—a very realistic function considering how many JPEGs are sent as mail attachments. Then, in *Excel XP*, BAPCo increased the size of the spreadsheet to put a heavier burden on today's CPUs. Other changes include the implementation of different filters in *Photoshop*.

We took a 2GHz Pentium 4 system and ran both *SYSmark2001* and *SYSmark2002* on it. The results were fairly similar. The machine scored an overall *SYSmark2001* rating of 188 and churned through content creation at 207 and office apps at 171. Under the updated *SYSmark2002*, the same box scored 181 overall, 224 in content creation and 146 in office productivity.

Plextor introduces the 40x

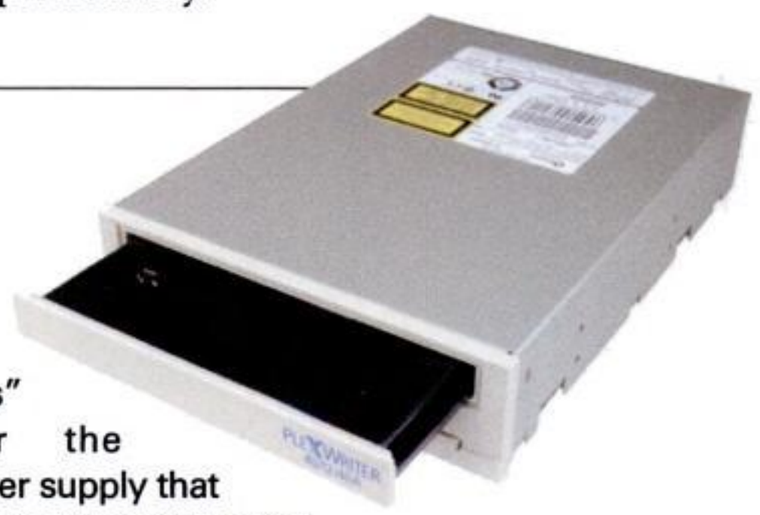
Stop the presses—another CD recorder outburns the competition!

Just moments after we finished testing Lite-On's super-snappy 32x CD burner (see the review on page 69), Plextor dropped a 40x burner through the roof of the Lab. It arrived too late for a full review, but just in time for an extended preview.

In the pursuit of the fastest disc-burning times on the planet, the PlexWriter shaved 16 seconds off our edge-to-edge burning test record. Here's a look at some preliminary results:

Using the bundled basic version of *Easy CD Creator 5*, the PlexWriter burned 647MB to a CDR in exactly 4:00 minutes—slower than the Lite-On 32x at 3:39, and slower than the world's record for the fastest mile run by a human, held by Hicham El Guerrouj of Morocco at 3:43. However, paired with *Nero 5.5.7.2*, the PlexWriter wrote the same data to a CDR in just 3:23 seconds—faster than both the Lite-On and Mr. El Guerrouj.

Also making a debut in the PlexWriter 40x are a number of tweaks designed to raise the quality of audio CDs created with the drive . Plextor's tweaks include "optimized PCB circuits" near the power supply that help decrease noise and, consequently, reduce jitter levels, and a black CD-holder tray, which the company claims reduces C1 error rates (C1 errors are the least serious flaws picked up by the error-correction scheme used in audio compact discs).



Check back with us in May for the full review and complete benchmarks.

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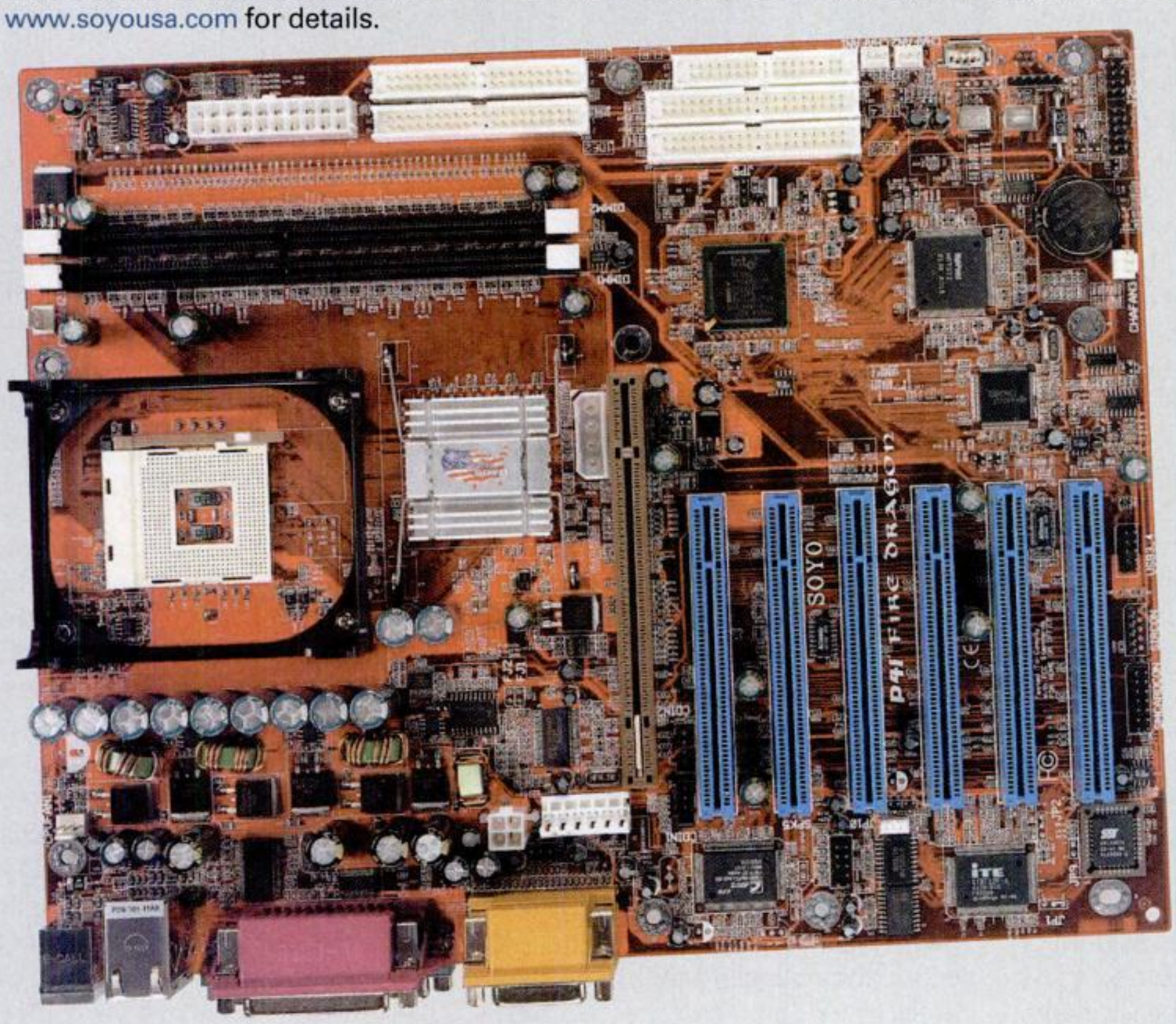
American Beauty

And we thought the Element PC we tested in January was patriotic

To aid the victims of the 9-11 terrorist attacks, Soyo says it will donate $5 to the Red Cross for every red, white, and blue P4I Fire Dragon motherboard it sells. Based on Intel's 845 DDR chipset, the board has onboard IEEE-1394, six-channel audio, and RAID support. Go to www.soyousa.com for details.



Trauma Kit Redux

TESTED & GEEK APPROVED

Can't find anyone who sells the medical-only tackle box we used in our February "HealYour PC" feature? Here are three worthy contenders for tucking away all the tools and tiny bits you use on PC troubleshooting house calls. You can find all three at www.planomolding.com.

• **Plano 8606.** The 8606 is pretty close in layout to the 747M we used in our February feature, but will set you back just $30 instead of $100. The 8606 is also better suited for lugging around bulkier components, such as large heatsinks and spare Ethernet and videocards.

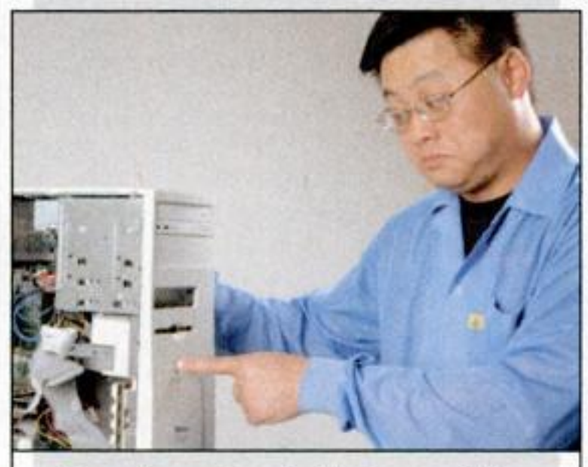
• **Plano 759.** Plano's top-of-the-line 759 has more nooks and crannies than a Thomas-brand English muffin. Two of the four drawers can be used as individual tackle boxes when removed from the larger unit. The 759 also features a top access section for often-used items.

• **Plano 757.** If it's your first year in the field, the four-drawer 757 is an ideal companion. It sports tons of cubbies, a large bulk-storage area on top, and two translucent storage compartments in the lid for quick 'n' easy access to vital instruments.

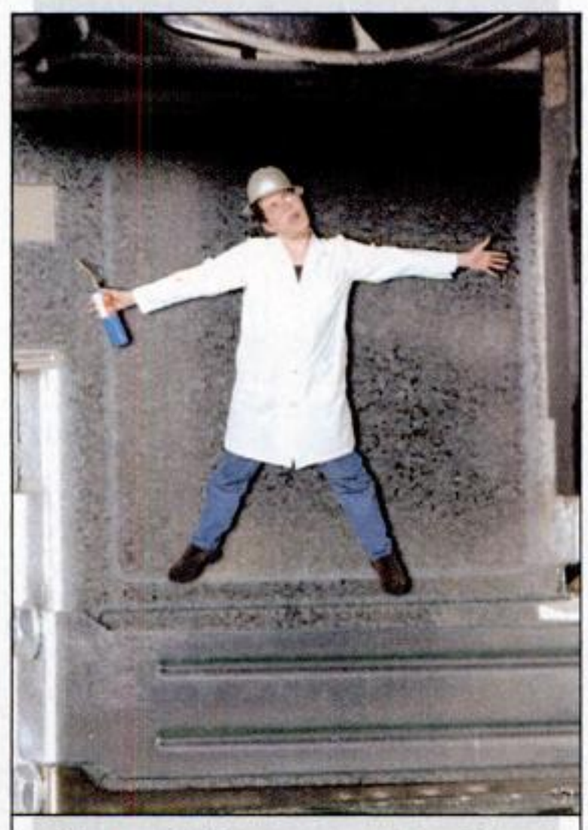
The Adventures of the Lil'est Intern

Last month we had successfully shrunken our intern to a conveniently diminutive size, and frankly we're in no hurry to regrow him. As a matter of fact, we're beside ourselves with excitement over all the possible uses for him as is.

Turns out this little feller can get down and dirty in all the nooks and crannies we could only ever dream of entering. Like this here busted IBM 75GXP hard drive.



The only problem is that some of the staff can't get used to watching out for the wee one's whereabouts.



It's a good thing we created such a sturdy lad.

to be continued...

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HP Pavilion 950

HP gave us 2200 megahertz and our first GeForce4

The HP Pavilion 950: What a beaut!

Hewlett-Packard managed to trump even the dedicated gaming PC companies (such as Alienware and Falcon Northwest) by showing up on race day with the first OEM'd GeForce4 videocard we'd ever seen. And this ain't the ghetto GeForce4 MX card that a certain fruit-bearing company in Cupertino is touting, but a top-of-the-line Asus GeForce4 Ti 4600. The Pavilion 950 also introduced us to our first OEM'd Northwood Pentium 4, a 2.2GHz. To boot, the rig came with 1GB of DDR266 memory, a 120GB Western Digital hard drive, and an HP DVD+RW drive. Not bad.

We were anxious to see how an Intel box would compare with the hoards of Athlon XP PCs that have overrun our Lab lately. Well, between the GeForce4 and the P4's few-hundred megahertz advantage, the Pavilion made short work of the Athlon XP machines in several benchmarks. Not surprisingly, the 2.2GHz P4 rocked slower P4s—as well as the Athlon XP crowd—in our high-quality MP3 encoding test. And in *Quake III Arena*, the GeForce4-equipped Pavilion whipped all previous contenders with 103.4fps.

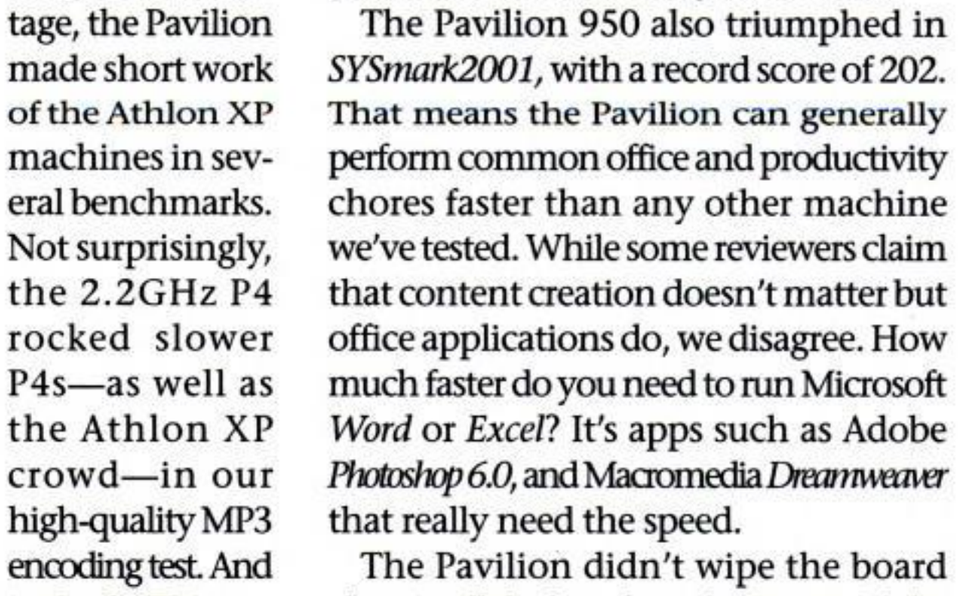
UNDER THE HOOD

THE BRAINS	
CPU	2.2GHz Intel Northwood Pentium 4
Motherboard	Asus P4B266-LA (Intel 845DDR chipset)
RAM	1GB PC2100 DDR memory (two 512MB DIMMs)
I/O ports	Front: one IEEE-1394, two USB 1.1, one 9-pin serial. Rear: two IEEE-1394, two USB 1.1, three analog-out audio with one capable of digital I/O, game port, serial port, parallel port, PS/2 keyboard and mouse
DISPLAY	
Videocard	Asus V8250 Ti 4600
Display	HP F-50 15-inch LCD
Natural res	1024x768
STORAGE	
Hard drive	120GB Western Digital WD1200BB
DVD-ROM	HP DVD100i DVD+RW (2.5/8/12/10/32)
CD-RW	Samsung SW-224B CD-RW (24/10/40)
NETWORKING	
LAN	Intel Fast Ethernet
SOUND	
Soundcard	Creative Labs Audigy SB0160
Speakers	Creative Labs Inspire 5300 5.1 speakers
MOUSE	
HP Optical USB	
KEYBOARD	
HP USB	
BUNDLE	
Windows XP Home, *MyDVD 3.0*, Intervideo *WinDVD*, Microsoft *Money*, Microsoft *Works*, Microsoft *Encarta*, Sonic Foundry *Super Duper Music Looper Xpress*, Detto *Intellimover*	
BOOT: 32 sec.	**DOWN: 27 sec.**

In *3DMark2001* Game 4, the GeForce4 was underwhelming, clocking in with a score of 31.3fps—just a hair shy of the Element PC we reviewed in February. The truth is, the GeForce4 isn't an all-out barn burner in our gaming benchmarks, but that's because we run our standard system review benchmarks with anti-aliasing turned off. With AA flipped on, the HP's GeForce4 Ti 4600 made short work of all the GeForce3 Ti-based machines we've reviewed in the past. See our cover story for details.

The Pavilion 950 also triumphed in *SYSmark2001*, with a record score of 202. That means the Pavilion can generally perform common office and productivity chores faster than any other machine we've tested. While some reviewers claim that content creation doesn't matter but office applications do, we disagree. How much faster do you need to run Microsoft *Word* or *Excel*? It's apps such as Adobe *Photoshop 6.0*, and Macromedia *Dreamweaver* that really need the speed.

The Pavilion didn't wipe the board clean in all the benchmarks. In our Adobe *Premiere 6.0* test, the rig came in a few seconds behind the fastest Athlon XP systems we've tested. Last month's Voodoo PC F-Class, for example, finished about three seconds ahead of the Pavilion.



Full benchmarking details in the Mag Reprints section of MaximumPC.com

Unfortunately, the Pentium 4 continues to suffer performance problems in applications that aren't optimized for the processor. The Athlon XP suffers a similar problem in the *SYSmark2001* benchmark because an unpatched version of *Microsoft Media Encoder*, a member of the *SYSmark2001* application suite, doesn't take advantage of recent Athlon XP code enhancements.

In the end, you have to pick your PC according to the tasks you intend to take on. For now anyway, the HP can't be beat—except by other Pentium 4 machines using RDRAM. In our own tests, 2.2GHz Northwood RDRAM configurations have turned in scores about 5 percent faster than similar configs using Intel's own DDR chipset. We believe the choice of DDR over RDRAM put a crimp on the Pavilion's scores, which, while great, could have been stellar. But that's a choice you'll have to make: a bit more performance or less-expensive memory. HP opted for a cost savings.

On the audio front, HP took an interesting tack and somehow secured a Creative Labs Audigy card without FireWire support. HP opted to use a separate FireWire card so it could plumb a port to the front of the case. Unfortunately, HP continues its tradition of bundling mediocre speakers by including a set of Creative Labs Inspire 5.1 speakers. Other components are top-notch, though, and include the 7200rpm 120GB Western Digital drive and a flat panel monitor that supports both DVI and analog input. While most would settle for the 12x CD burning capabilities included in the DVD+RW drive, HP took the path of glorious overkill by including a Samsung 24/10/40 CD-RW drive.

If we had a do-over, we'd probably spec the Pavilion with RDRAM instead of DDR. And while we applaud the DVI-ready flat panel, 15-inch displays are plain quaint these days. But you can't

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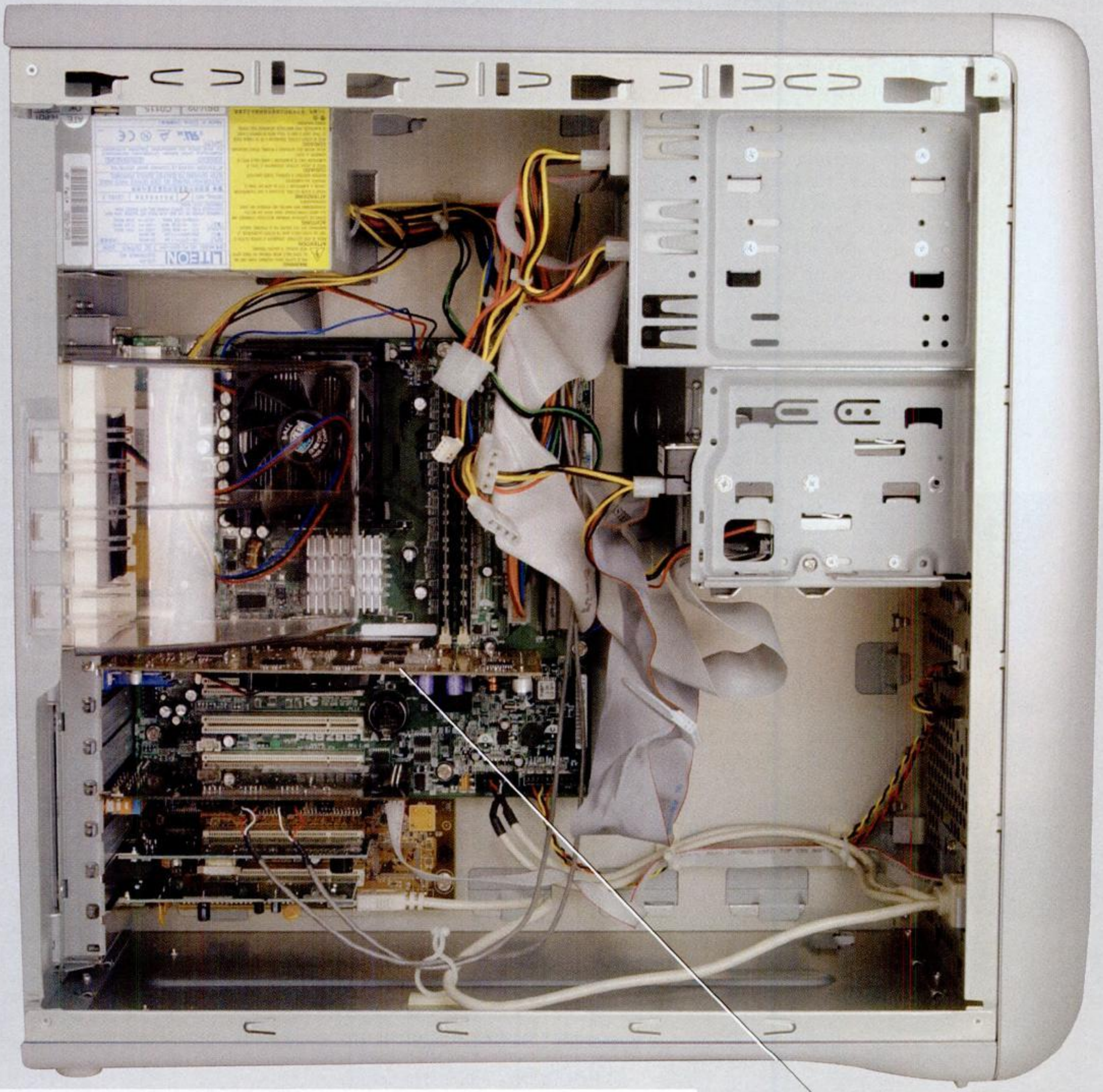
Mount me!: The front panel includes a single six-pin FireWire port, two USB 1.1 ports, and a serial port for old-time PDA owners.

Dynamic duo: HP opted for overkill by including not just a DVD+RW drive but also a 24x CD-RW drive.



Circuit city: Between the Northwood Pentium 4 and the GeForce4, the Pavilion 950 packs more than 110 million transistors.

argue with the Pavilion's specs and the performance. This HP is the first PC we've seen to slip beyond the magical 200 mark in *SYSmark2001*, and it just pulverizes all the GeForce3-equipped machines in our punishing *Quake III Arena* test. Despite the looming merger of HP and Compaq, and rumors that one of the companies may eviscerate its PC division, the Pavilion 950 conjures up memories of the past magnificence of big PC potentates.

— GORDON MAH UNG

MAXIMUMPC VERDICT

Pavilion 950

HEWLETT-PACKARD

+ CUSTOMER SATISFACTION

Nothing says "*oh yeah*" like a 2.2GHz Northwood P4, GeForce4 Ti, and 1GB of memory.

– THE COMPLAINT DESK

Damn our eyes! With these specs, we would rather have had RDRAM.

www.hp.com

$3,100 ($2,650 w/o monitor)

9

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A Tale of Two Flatties

Philips and NEC prove a digital interface isn't always necessary

Wasn't too long ago that a pure digital interface was necessary for pristine LCD visual quality. Indeed, if your flat panel didn't employ a DVI connector, your display would suffer shimmery video noise up the ying-yang. But times have changed. Both of the LCDs we reviewed this month absolutely obliterated pixel tracking and timing lock problems (that's the fancy name for the video noise that comes as a byproduct of the analog conversion process), though one did so only after a bit of tweaking.

NEC MuiltiSync LCD 1830

Philips Brilliance 150P2D

Slick, black paint job. Portrait and landscape modes. It even comes with a DVI connector for people who aren't yet convinced that the screen shimmer induced by analog conversion is yesterday's news. So what's not to like about this 15-inch panel? Uh, how about the grayscale reproduction. During *DisplayMate* testing, the Philips simply couldn't display extremely light shades of gray against a pure white background. The problem manifested itself across a number of *DisplayMate* test screens (which are brutal in their ability to evoke monitor flaws), but didn't rear its ugly head when displaying less demanding real-world visuals. And we were thrilled by the Philips's ability to render high-detail, 24-bit color JPEGs without dithering.

Philips Brilliance 150P2D

Screen uniformity? Excellent—no darkening around the screen edges. Ghosting and streaking? Nada—it appeared in neither *DisplayMate* tests screens nor when we ran test video. Font reproduction? Not so good—Times New Roman text became illegible below 7.5 point, so if you plan on looking at smaller type with your beady little weevil eyes, this isn't the monitor for you. Then again, with a natural screen res of just 1024x768, even 11- and 12-point type will render pretty damn large. All in all, the 150PD is an impressive piece of technology. But we're withholding our highest honors because in a crowded field of competitors, it's neither the first nor second best-looking LCD we've seen, nor the best value.

NEC MultiSync LCD1830

This is the same 18-inch monitor that received high praise in last month's SuperDell PC review. We're glad we looked at it again, because under closer scrutiny it revealed some flaws.

First, when we reset the panel with its auto-adjust button, it exhibited significant video-noise shimmer in *DisplayMate*. Only after tweaking the panel's onscreen controls did the noise go away, hitting the pristine quality benchmark set by the Philips display. That's all sweet and dandy, but how many "Minimum PC" consumers will simply live with their auto-adjust settings, never knowing that their new NEC is capable of much higher quality?

Second, the NEC suffered noticeable grayscaling problems across a number of *DisplayMate* test screens. In quantifiable terms, it looked as if the monitor displayed pure white in any grays lighter than 10 percent gray, and pure black in any grays darker than 90 percent gray. Even graphic designers would probably have trouble noticing these flaws on a day-to-day basis, but, rest assured, if you buy the LCD1830, you won't be able to jump into our online forums and proudly declare, "I have the best LCD grayscaling in the world!" And wouldn't *that* be a shame.

Nonetheless, the LCD1830 is still one fine looker. Text reproduction was acceptable down to 6.8-point, which makes sense considering the panel has a relatively fine natural screen resolution of 1280x1024. Screen uniformity was also top-notch, and the panel comes with an integrated power supply, dual analog inputs (though no DVI input), and a full set of onscreen controls for fine-tuning your picture. It costs about $200 more than the typical 15-inch monitor, but at 18-inches diagonal, it can truly function as a solitary desktop display.

—JON PHILLIPS

MAXIMUMPC VERDICT

Brilliance 150P2D
PHILIPS

+ VA-VA-VA-VOOM
No analog shimmer, great color reproduction, integrated power supply, landscape and portrait modes.

– EH
Bad light-grayscale and small-font reproduction. And can a 15-inch LCD really be considered kick-ass?

www.philipsusa.com
$530
8

MAXIMUMPC VERDICT

MultiSync LCD1830
NEC

+ DREAMBOAT
18-inches, near-pristine image quality, integrated power supply, dual inputs.

– SHIPWRECK
You have to eschew auto-adjust if you want to get rid of video noise. Grayscaling was suspicious on both ends of the scale.

www.necmitsubishi.com
$750
8

THE CASE AGAINST FLAT PANELS

LCD panels have only one natural screen resolution (their highest resolution), and if you set the monitor to a lower resolution, pixel interpolation will give you a case of the jaggies. So, unless your videocard is capable of acceptable 3D gaming frame rates at 1280x1024, you might reconsider buying a flat panel with a natural screen res of 1280x1024.

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Sound Blaster Extigy

Half breakout box, half soundcard, Creative Labs' latest gem whips USB audio into shape

Life just got easier for the timid, technology-shy weenies who are so intimidated by their own PCs, they won't even open their cases to install a soundcard. Creative Labs' new Extigy is actually an *external* soundcard that plugs into a USB port instead of a motherboard PCI slot.

We know what you're thinking: USB audio is a whole mess of trouble. Indeed, when the concept was first introduced back in the days of Windows 98, it suffered a bunch of flaws. In the original USB audio paradigm, your PC pumped digital data directly through your USB port into USB speakers, which decoded the digital audio locally. In theory, USB speakers would lower the overall cost of PC manufacturing (removing pricey soundcards from the equation entirely) and also offer superior sound quality, thanks to their pure digital modus operandi.

In reality, however, USB speakers were a bomb. For starters, too many consumers were still running Windows 95, which offered only spotty USB support. Even worse, USB speakers were horrible CPU cycle hogs, so whenever you web-surfed, edited images, or did *anything* remotely CPU-intensive while listening to music, your sound would drop out!

Well, times have changed. USB is now ubiquitous, and today's fastest PCs have sufficient CPU power to decode audio and perform other computing tasks at the same time (though, as we discovered, the USB bandwidth dilemma hasn't been completely erased).

Once the Extigy is connected to your PC via a USB port, you can use the card's many interfaces to plug in speakers, microphones, MIDI devices, headphones, and so on. The Extigy can also be used as a stand-alone Dolby Digital 5.1 decoder for use with PC-based DVD players, set-top DVD players, and even Xbox game consoles. You can even get creative and play stereo-source audio (such as the music from portable CD and MP3 players) over your 5.1 speaker system. For what it's worth, Creative has greatly improved its faux–surround sound algorithms (better known as CMSS), but we'd still prefer a stereo-doubling option.

The Extigy doesn't use the exact same processing chip found in the Audigy line of internal soundcards, but sound quality is still rated at 24-bit/96KHz with a 100dB signal-to-noise ratio, and you still get support for DirectSound3D and EAX environmental sound in games. Unfortunately, the Extigy does *not* support Creative's Advanced HD effects, which were introduced with the Audigy. Why? Because the USB 1.1 bus doesn't offer enough bandwidth to render them. USB 1.1's limited bandwidth also prohibits you from applying realtime effects to captured audio—so you can forget about using the Extigy as an all-in-one audio production device.

Creative Labs told us the Extigy still relies on a PC's CPU to handle sound effects processing in games, and cautioned that some people may experience occasional sound dropouts. But for what it's worth, we couldn't make the sucker choke. On a 2.2GHz Pentium 4 rig running WinXP, we successfully played a *Quake III Arena* timedemo, an MP3 file, and a Dolby Digital 5.1 DVD movie all at the same time without causing the Extigy to so much as hiccup. And when playing both an audio CD and MP3 file while simultaneously piping an MP3 device through the Extigy's line-in port we didn't experience any audio dropouts. Of course, you shouldn't expect the same results on, say, a 400MHz Pentium II rig running Win98.

With an embarrassment of connector options, the Extigy will be your ally in almost any situation.

The Extigy wins big for its versatility. It makes upgrading way simple, comes loaded with connector interfaces, and even includes a remote. If you want to ditch your notebook's lame excuse for a sound solution or are looking for a Dolby Digital 5.1 decoder that can be simultaneously attached to your PC and Xbox, then you've found the answer. Heck, your PC doesn't even need to be on to use the Extigy. But if these specific benefits don't appeal to you, instead get one of Creative's Audigy/Live Drive! bundles and avoid the bandwidth constraints of USB 1.1 entirely.

—GORDON MAH UNG

MAXIMUMPC VERDICT

Sound Blaster Extigy
CREATIVE LABS

PARTY ON
With its support for EAX, DirectSound3D, and hardware Dolby Digital 5.1 decoding, the Extigy is a natural fit for gaming notebooks and game consoles.

BUMMER, DUDE
Integrate USB 2.0 or FireWire support and you've almost got a Kick-Ass product.

www.creative.com
$150
8

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Koolance PC2-601

Overclocking made easy—just add water

Induction cowling: These fans suck air through the radiator and directly vent air out of your PC, instead of letting it turn into a tiny Betty Crocker oven. The display can be set to Fahrenheit or Celsius, and a button lets you pick three different temperature-controlled fan speeds. Slower speeds equal less noise.

If you're looking for something more exotic than triple-fanned copper heatsinks, but you're not into hacking and slashing your case with a die grinder, Koolance's PC2-601 may be just the ticket. Koolance's third-generation water-cooled case brings exotic liquid cooling within the reach of greenhorn overclockers.

The PC2-601 is based on a standard SX-1030 Antec-clone case and features an aluminum radiator—known in cooling parlance as a "heat exchanger"—mounted on top. The exchanger occupies the space of the top drive bay, but you'll still have room for three full-size drives. Cool water is pumped from the heat exchanger through a bunch of plastic hoses, each of which connects to a metal cooling jacket that's attached to one of your heat-emitting PC components. Your CPU, motherboard chipset, videocard, and hard drive are all ripe candidates for Koolance water-cooling. Each cooling jacket is a two-way system: Cool water flows in, draws heat from your sweltering part, then flows out through a secondary hose to eventually be recirculated through the heat exchanger. The system is sealed, so water never touches any of your hardware.

Our Koolance kit was designed for use with a Socket 478 Northwood Pentium 4 (Athlon rigs are also available) and came with cooling jackets for the CPU, chipset, and graphics chip. Because our motherboard (an Asus P4T-E 850) featured a new-style, hook-on chipset cooler, we couldn't use the Koolance chipset jacket. Building the system was fairly easy, but we did experience a few problems. When working with the first review unit we received from Koolance, we inadvertently snapped off a plastic pump inlet—we basically touched it and it broke. We're not sure if we were too rough with it (unlikely), or if the inlet was damaged during shipping, but we'd certainly have more confidence in the rig's build quality if the pump inlets were constructed of a sturdier material, such as brass. The fit between the power-supply cavity and heat exchanger is also a little tight. You have to provide your own power supply, and if you're using one that's a bit longer than the standard ATX power supply, you may run into trouble.

We had no problems setting up our replacement rig, and the results were fairly impressive. Using our Asus mobo and 256MB of Kingston PC800 RDRAM, we successfully overclocked a 2GHz Northwood to 2.4GHz before running out of steam. (If you think a mere 400MHz is chump change, please remember that not every CPU will overclock to high hell.) We also overclocked the core of a Leadtek GeForce3 to nearly GeForce3 Ti 500 levels. The water-cooler kept the CPU near room temperature, and even more impressively, the notoriously hot GeForce3 was cool to the touch as well.

The Koolance doesn't use point-to-point water lines that shoot heated water directly from each cooling jacket to the heat exchanger. Instead, heated water travels in a circuitous route—a chain, if you will, from the CPU to the chipset to the graphics chip. Koolance says the temperature difference of the water from one cooling jacket to the next is less than 1 degree Celsius, and points out that a point-to-point system wouldn't have been possible in such a confined case interior. We were initially skeptical, but our test system had plenty of cooling capacity to spare.

That said, we would have liked a way to cool down our GeForce3's memory. By replacing the videocard's standard fan with a cooling jacket, you also lose the sole fan that moves air over the card's memory. Our video memory heated up to 130 degrees Fahrenheit and started crashing our system. Only by directing air onto the card with a floor fan were we able to keep our videocard stable. To wit, if you want to overclock your video chip, you'll need active-cooling across the whole card.

The PC2-601 case itself cost $235. The Socket 478 cooling jacket was $43, and the graphics chip jacket was $18. You would be hard-pressed to get an appropriate case, complete water-cooling apparatus, and all the tools you'd need to put it together for less. The latest Koolance kit also includes a heat probe that sits under the CPU water jacket and shuts down the system if it senses that a Pepsi syndrome is imminent.

Clearly, not everyone will want to run water next to $3,000 worth of components. But if you want to get into liquid cooling without all the hassle, the PC2-601 is worth a serious look-see.

—GORDON MAH UNG

MAXIMUM PC KICK ASS PRODUCT

WHY GO WATER?

Water-cooling offers several key benefits over the typical heatsink/fan combo. The most obvious is increased CPU overclockability—water-cooled CPUs can simply run faster than the best heatsink/fan-cooled CPUs. Water-cooling also addresses those nasty heat pockets that can affect your entire case interior. Traditional heatsinks may cool the parts they're attached to, but without proper airflow, they allow heat to build up inside your case, and this can affect the stability of your entire system. Not so with a water-cooled rig. Because all the heat is dissipated through the heat exchanger, the case requires just three, quiet thermal-controlled fans above the heat exchanger to keep the system cool. Overall, a water-cooled rig runs much quieter than a typical multi-fanned, overclocked monster.

Of course, the downside is obvious: Plumbing and electricity sometimes don't mix. Koolance says leaks are extremely rare, but if you do puncture a hose you're going to be in a world of hurt.

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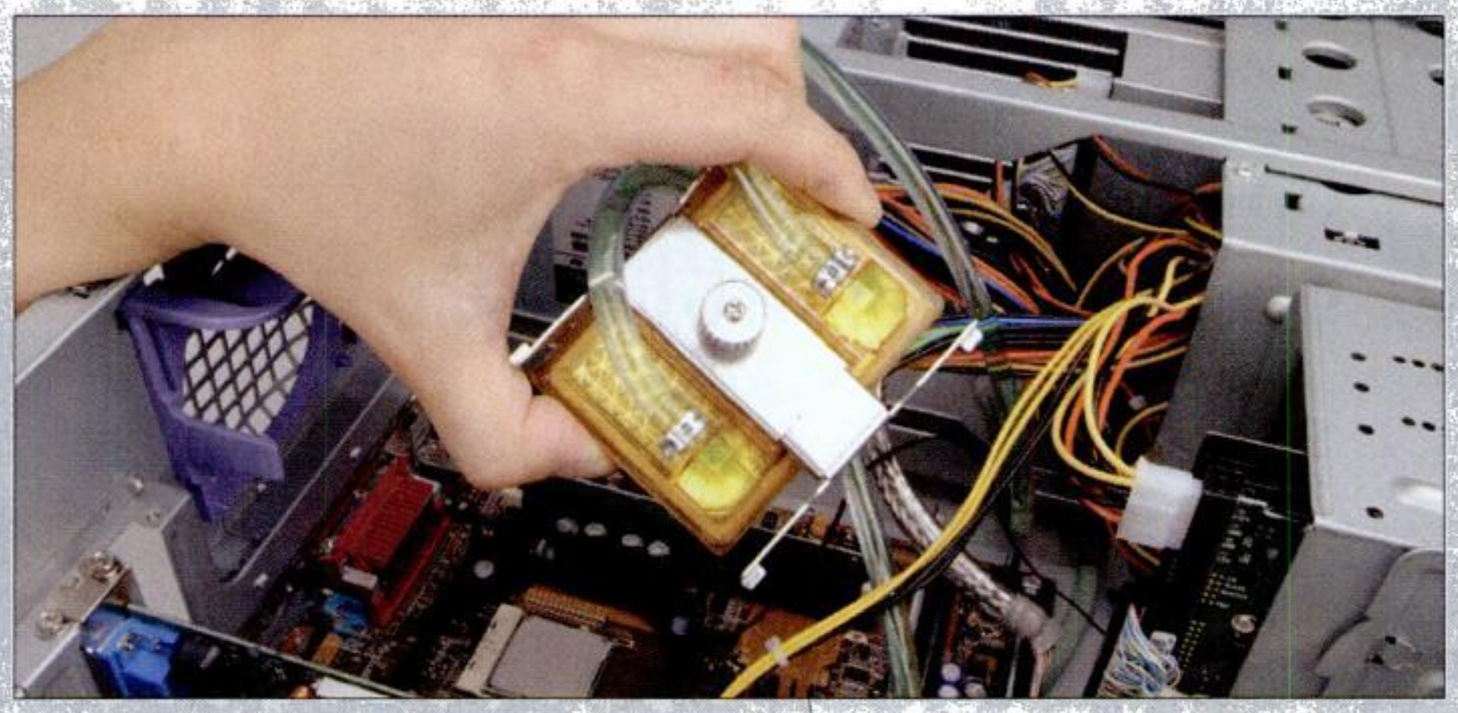
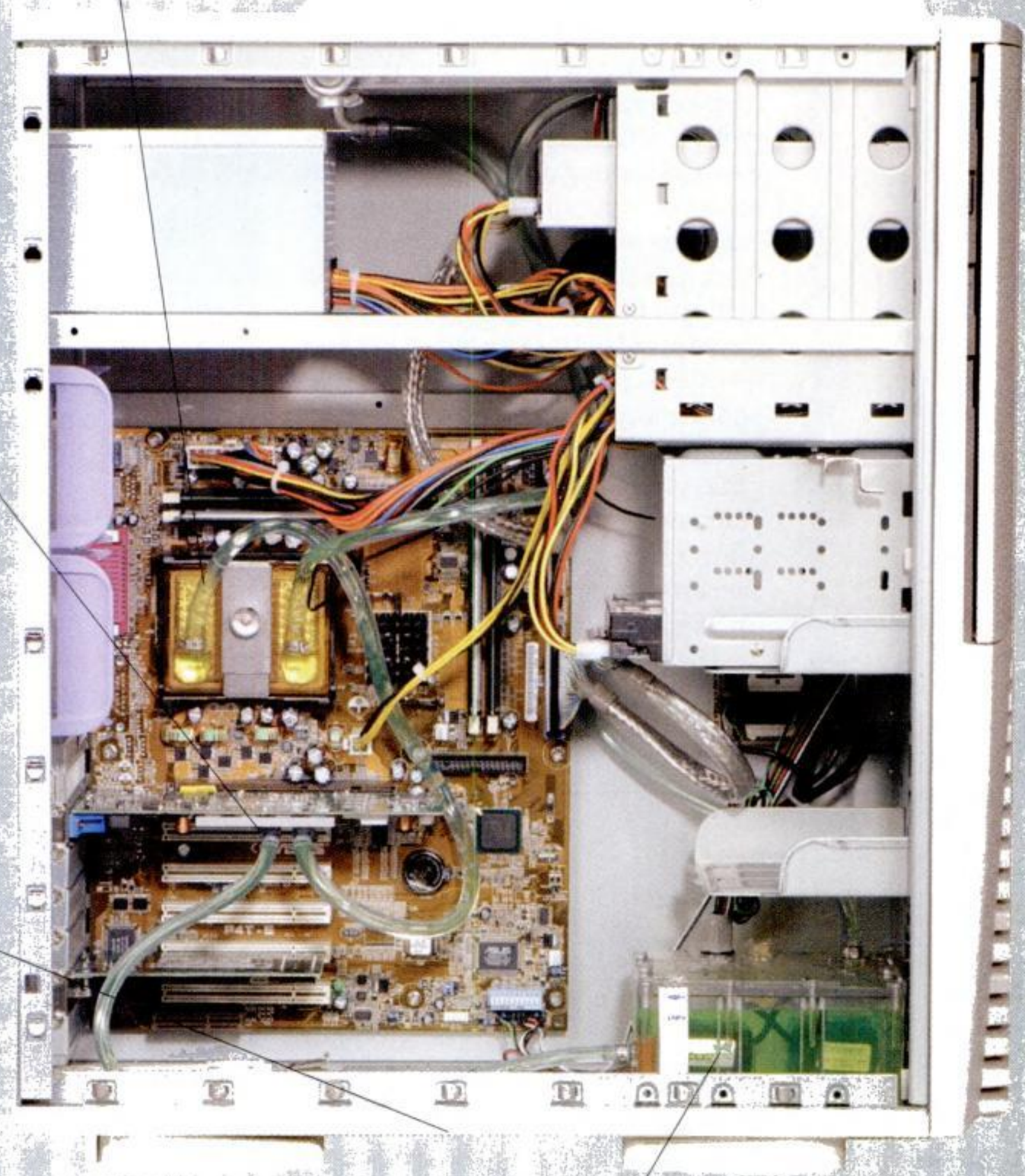


Full metal jacket: The new Socket 478 adapter snaps into place using a well-engineered clamp that prevents you from over-tightening the mount and damaging the water jacket or CPU. Also note the tiny triangles that increase the surface areas inside the water jacket and aid in cooling.

Brrrrr!: You'll lose the ability to use the PCI slot adjacent to your AGP slot, but the PC2-601 will make even the hot-headed GeForce3 downright chilly. We just wish the system could also chill our video memory, which got hot enough to fry a banana-and–peanut butter sandwich.



Bungholio: There's got to be an easier way to refill the PC2-601 than turning the entire PC upside down.

Double-pumped: If only humans had two tickers like the PC2-601, we might still have the great actor John Candy. Koolance says, "If one water pump should fail, the other will maintain flow, allowing the system to gradually shut itself down."

MAXIMUMPC VERDICT

PC2-601
KOOLANCE

+ CHILLY-CHILL

You get water-cooling bragging rights without all the hassle. And who wouldn't want a much quieter PC?

– WIGGY-WIGGY-WACK

Our plastic inlet broke—should this happen again, it's bye-bye to thousands of dollars worth of components.

www.koolance.com
$296 as tested

9

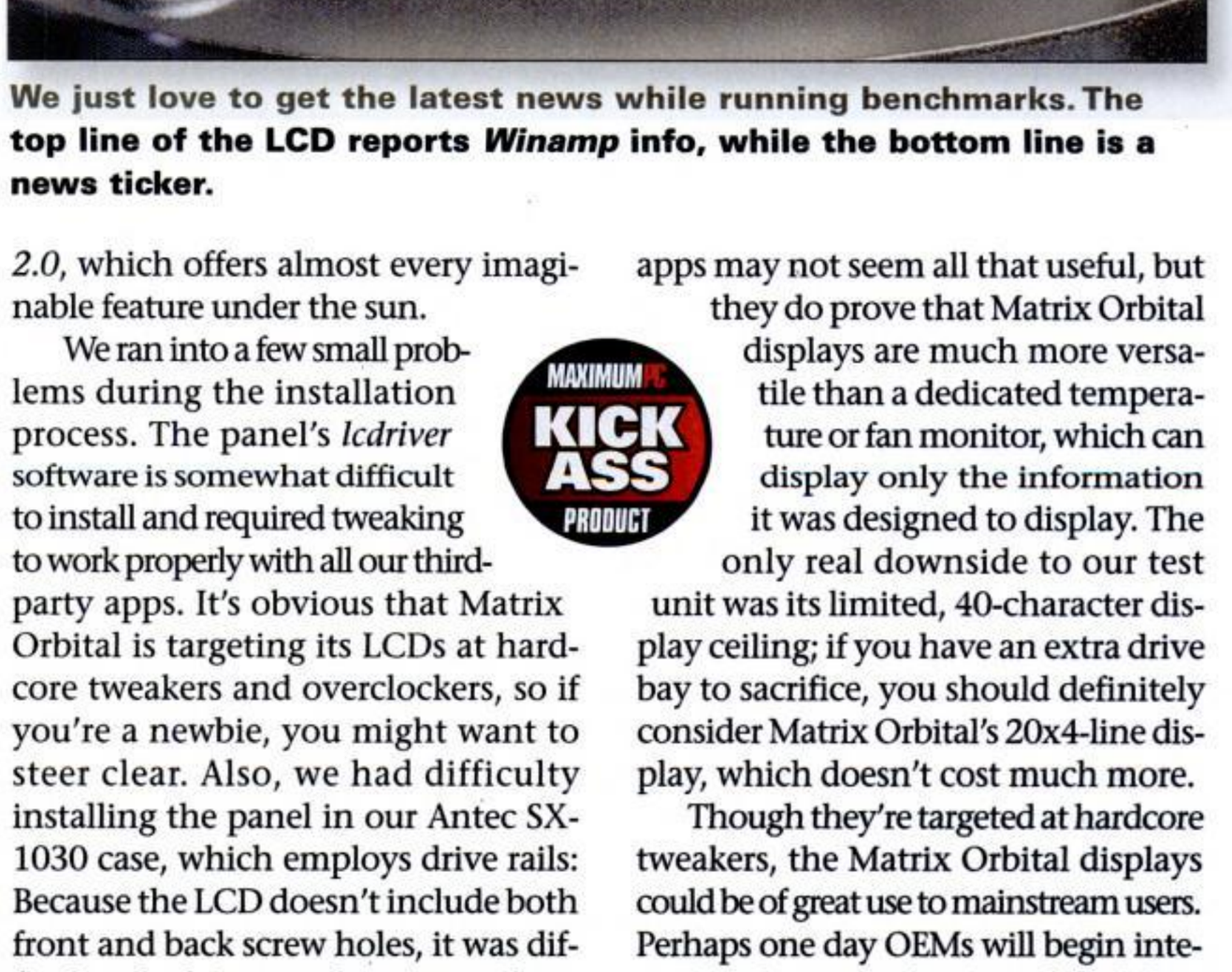
Matrix Orbital LCD Serial Interface

Beauty and brains in a 40-character display

Hardcore case modders looking for a bit of utilitarian flair will find an abundance of riches in this LCD Serial Interface. What we have here is essentially an LCD panel that fits into one of your drive bays and displays information that's relayed to it via your PC's serial port.

The data displayed on the panel is limited only by the imagination of third-party application developers; currently available apps can display hardware monitoring data (such as the temperature of your CPU), hard drive usage, gameplay stats, MP3 song information, stock quotes, and news headlines. And that's just the tip of the iceberg: Because the apps are written for Windows and not some proprietary, onboard OS, application development should be familiar to most code hackers. If you're game, you can even take a stab at writing your own custom C/C++ applications. Matrix Orbital fully supports such shenanigans, offering code examples on its web site to help get you started.

The LCD can be mounted in a standard front drive bay, in an external enclosure, or in a custom-case cutout if you want to get busy with a jigsaw or Dremel tool. Matrix Orbital sells separate shapes and sizes for all your needs, but we chose to review the standard PC bay insert display, otherwise know as BLK202A-4BR. This particular model features seven input keys for interface navigation, and displays two lines of text, 20 characters per line. If you like, you can run several displays simultaneously. Please note: Matrix Orbital sells its units "as is," with no software support. Luckily, this isn't too much of a problem because you can find numerous free applications online. Our personal favorite is Borderfield's *LCDCenter 2.0*, which offers almost every imaginable feature under the sun.



We just love to get the latest news while running benchmarks. The top line of the LCD reports *Winamp* info, while the bottom line is a news ticker.

It's not rocket science, but the Matrix Orbital serial pass-through is an interesting solution.

We ran into a few small problems during the installation process. The panel's *lcdriver* software is somewhat difficult to install and required tweaking to work properly with all our third-party apps. It's obvious that Matrix Orbital is targeting its LCDs at hardcore tweakers and overclockers, so if you're a newbie, you might want to steer clear. Also, we had difficulty installing the panel in our Antec SX-1030 case, which employs drive rails: Because the LCD doesn't include both front and back screw holes, it was difficult to lock it securely to our rails.

Once working, the LCD was bright and clear under direct lighting. When displaying fast-moving, scrolling stock updates, it suffered some refresh problems, which forced us to ratchet down the speed settings on our stock ticker to slower than we would have liked. In our standard test bed, which employs the Intel 850 chipset, we were able to access hardware monitoring features that read the internal temp of our CPU, the speed of the fans connected to our motherboard headers, the speed of our CPU, and the amount of free system memory. We also fired up an e-mail checker app and were able to use the LCD to check our e-mail through a POP3 account. OK, so some of these apps may not seem all that useful, but they do prove that Matrix Orbital displays are much more versatile than a dedicated temperature or fan monitor, which can display only the information it was designed to display. The only real downside to our test unit was its limited, 40-character display ceiling; if you have an extra drive bay to sacrifice, you should definitely consider Matrix Orbital's 20x4-line display, which doesn't cost much more.

Though they're targeted at hardcore tweakers, the Matrix Orbital displays could be of great use to mainstream users. Perhaps one day OEMs will begin integrating these wonders into their PCs—though we imagine they would probably be used for advertising rather than for something truly useful.

—JOHN TUMMINARO

MAXIMUM PC KICK ASS PRODUCT

MAXIMUM PC VERDICT

PC Drive Bay Display
MATRIX ORBITAL

+ YIPPPPPIE!
More potential uses than duct tape, reasonable price, and we dig the way it looks in our PC.

– WAAAAAHH!
Driver setup is somewhat complicated, and mounting may be precarious in cases that use drive rails.

www.matrixorbital.com
$104
9

Copyrighted material

AVerTV Studio

We came, we saw, we time-shifted

If you own a TiVo or ReplayTV, you already know the satisfaction of undoing the TV networks' best-laid plans. Armed with just a simple remote, you can rearrange their precious programming schedules and squash their interminable commercials. It's called "TV time-shifting," and as luck would have it, you don't need a fancy set-top box to enjoy all this godlike fun. No, you can actually run TV time-shifting right off the hard drive living in your existing PC—all of which leads us to the AVerTV Studio.

A TV tuner plus a personal video recorder plus an FM radio plus a remote control. How fun is that?

The heart of the AVerTV Studio is a classic analog TV/FM-tuner PCI card that can accept antennae, cable, composite, and S-video inputs. Like most other TV-tuner cards, it offers options for closed-captioning, blocking Skinemax from the kiddies, and simultaneously previewing the thumbnails of 16 different channels in a wacky video-quilt effect. You can view the card's output either full-screen or in a resizeable window.

But let's talk about why we're really here: TV time-shifting. At the press of a button, the AVerTV Studio begins recording whatever's being broadcast directly to a temp file sitting on your hard drive (the device records in MPEG-2, which is the same high-quality format used in DVD movies). When nature calls, you can pause the broadcast, then later resume play at the press of a button—the AVerTV Studio simply plays back all the video you missed from buffered memory. When you hit a commercial, you can fast-forward past it in 10-second increments (assuming you have a bunch of video sitting in the recording buffer). When you catch up with the live TV signal, the Studio seamlessly drops back into its normal viewing mode. The whole scheme is useful, fun, and exactly the kind of thing our parents never got to do.

The AVerTV Studio also offers two additional recording modes. The VCR mode lets you schedule recordings for future playback and offers a variety of compression options to increase video quality or, conversely, use less hard drive space. In VCR mode, you can't time-shift when a show is being recorded. However, an "I-Record" mode combines the time-shifting and VCR functions. In this mode, you can not only save video for future viewing, but also time-shift forward and backward for instant replays (you can't go backward in the regular time-shifting mode). All the video is compressed in realtime to your hard drive in MPEG-2 format, playable through the Studio or in *Windows Media Player*.

It's a crying shame that AVerMedia chose to model the Studio's software interface on the most demonic and universally reviled of all hardware interfaces: the VCR front panel. Luckily, a bundled remote control provides one-button access to all the device's features, bypassing the unfortunate VCR simile.

ATI's All-in-Wonder and nVidia's Personal Cinema both offer TV time-shifting capabilities and remote controls—but these components are expensive combo cards that automatically double as your primary AGP videocard. The downside with these babies is that if you ever want to upgrade your 3D acceleration, you might have to ditch your TV tuner in the process. But not so with the relatively inexpensive AVerMedia Studio—it operates independently of your primary videocard.

The AVerMedia Studio doesn't boast the robust channel guide and "To Do List" scheduling features offered by TiVo and the ATI and nVidia cards. But for a mere $80, it reminds us that, once again, we are in control.

—LOGAN DECKER

Primary Surface vs. Overlay: What's the Diff?

One of the shortcomings of the AVerTV Studio is its rather skimpy documentation. While the manual recommends the use of "Overlay" as opposed to "Primary Surface" mode, it never explains why. Well, here's the short story:

Primary Surface is the old-fashioned way of viewing video broadcast on your PC's monitor—video is transferred directly to the memory of your graphics card. Overlay, meanwhile, transfers video to a "hidden" area of your graphics card's memory. In this buffer, additional information (such as closed-captions) may be overlaid on top of the video before being sent out to your screen. This method requires special hardware and drivers, which have been integrated into most videocards made in the last two years. Predictably, overlay is preferable.

MAXIMUMPC VERDICT

AVerTV Studio
AVERMEDIA

+ DIGITAL CABLE
Why should TiVo geeks have all the fun? AVerTV Studio provides most of the time-shifting excitement without the messy subscription fees.

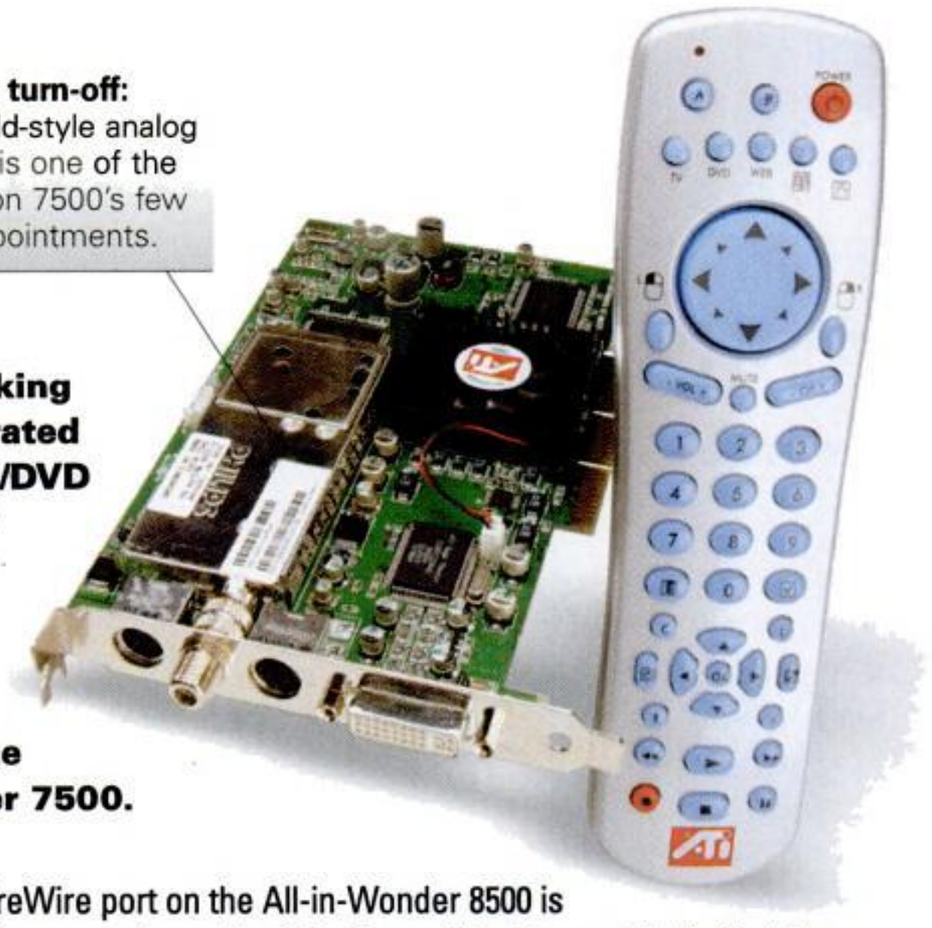
– RABBIT EARS
The software has a clunky, first-generation feel, the absence of a digital tuner kinda sucks, and once you've grown accustomed to TiVo's scheduling interface, it's hard to go back.

www.avermedia.com
$80
8

Copyrighted material

ATI All-in-Wonder Radeon 7500

TV time-shifting, DVD decoding,
and a remote control in an inexpensive package



Tuner turn-off: The old-style analog tuner is one of the Radeon 7500's few disappointments.

If you're looking for an integrated TV watching/DVD playback/3D accelerator with a remote control, check out the All-in-Wonder 7500.

While the All-in-Wonder Radeon 8500 DV we reviewed last month is a great "do-everything" videocard for gamers, TV aficionados, and all-around couch potatoes, its $400 price tag can be off-putting for casual consumers. Luckily, ATI has an alternative. The All-in-Wonder Radeon 7500 offers all the best multimedia features of the 8500 version at a $200 discount. You just can't use the card to play the most graphically advanced games in all their visual splendor.

Like all All-in-Wonders, the Radeon 7500 includes a TV tuner, DVD playback software, TV time-shifting software, and an awesome remote control. But notably absent in this less-expensive package are a world-class 3D graphics chip, a FireWire port, and ATI's advanced silicon tuner chip.

Hardcore gamers won't be satisfied with anything less than the pixel-pushing power of the Radeon 8500's R200 chip. That said, the 7500 should still fit the bill for cost-conscious consumers who want rudimentary gaming, TV, and video-capture support. If you're simply an occasional game player, then the R100 chip situated on the 7500 should be more than sufficient for your 3D acceleration needs. The chip is teamed up with 64MB of 180MHz DDR SDRAM and will produce playable frame rates at 1024x768 in all but a handful of today's games.

BENCHMARKS	
3DMark 2001 Game 2	31.1fps
3DMark 2001 Game 4	Can not run
Quake 3 MPC demo	42.2fps

NOTE:All benchmarks are run on our 1.3GHz Pentium 4 testbeds with 256MB of RAM. Vsync is disabled. No wombats were harmed during the running of these benchmarks.

While overclocking the 7500 is possible, it's already running at a breakneck 260MHz core, and overclocking won't help this board's real 3D shortcoming, the lack of programmable shaders.

While the FireWire port on the All-in-Wonder 8500 is a handy convenience, we're not terribly disappointed to see it left off of the 7500. FireWire cards are available for less than $30, so if you need an IEEE-1394 port and have a bunch of open PCI slots, just plunk down for a stand-alone card. However, we do lament the loss of the "TV-tuner-on-a-chip" which eliminates the annoying lag that occurs during channel changes. The All-in-Wonder 8500 includes it, but the 7500 makes do with a traditional—and sluggish—crystal-based tuner.

So it's really your decision. If you want to save $200, but sacrifice a few noteworthy features, go for the 7500. But if you want to join the All-in-Wonder club and are absolutely intent on playing DirectX 8 games with all their visual effects enabled, the 8500 is your only choice.

MAGIC EIGHT BALL: Our sources say "yes" to the Radeon 7500 All-in-Wonder, thanks to its great versatility and low price.

PET ROCK: Old-school 3D acceleration and a crotchety old-style tuner make the 7500's outlook not so good.

—WILL SMITH

MAXIMUM PC VERDICT: 7

$200, ATI Technologies, www.ati.com

HP WP110 Wireless Printer Server

Hewlett-Packard cuts your printer wires

HP's WP110 wireless print server is perfect for those who want to move printers off their desk, but not for multifunction devices.

If being sandwiched between a 21-inch monitor and a laser printer has you feeling like Starvin' Marvin jammed between two football players in a buffet line, HP's new WP110 might be the answer. Essentially a print server tied to a Wi-Fi card, the WP110 lets you relocate a printer within 100 feet of your access point—and off your desk, where it's simply cramping your style. Instead of configuring the WP110 via a USB, serial, or Ethernet connection, you must initially configure it over an 802.11b wireless connection. HP's directions will likely be sufficient for most *Maximum PC* readers, but we suspect newbies might run into headaches. Once configured, however, the WP110 should perform with blissful uneventfulness. HP qualifies only a few printers for use with the WP110, but we successfully mounted an Epson 850Ne to the print server. We also had no problems mounting an HP 1150c multifunction printer. Unfortunately, while the device lets you print to a multifunction printer/copier/scanner device, you can't scan or fax from one. That's a major minus for the WP110, seeing as how multifunction devices are all the rage these days, and are usually the first things you want to get the hell off your desk.

Nonetheless, the WP110 functions just as advertised. You can even use its PC Card slot to hack in an antenna for greater range. Its price is a bit steep for such an unglamorous product, but if you want to share a single printer among multiple machines, the WP110 will let you put the printer almost anywhere you desire. It supports infrastructure modes (for use with an access point) and peer-to-peer modes (for direct communications), as well as both 40-bit and 128-bit encryption to keep your data private.

PRETTY IN PINK: If you've ever wanted to move your printer next to the kitchen toaster, now's your chance.

PAINT IT BLACK: Wireless-only configuration can make the WP110 seem a little cranky at first.

—GORDON MAH UNG

MAXIMUM PC VERDICT: 8

$300, Hewlett-Packard, www.hp.com

Copyrighted material

Lite-On 32/12/40 CD-RW

The fastest burner we've ever tested?

Don't ask, don't tell: We're not sure we want to know how Lite-On manages to sell such awesome drives at rock-bottom prices.

One day, we were all sitting in the Lab, eating lunch, when a small, unassuming package arrived. Inside was a 32x CD-RW drive with a poorly translated installation guide ("Only one recoding software could be existed at PC to prevent possible conflict"). Undaunted by the broken English, we plugged in the drive, ran a few benchmarks, and watched Lite-On calmly blow away benchmark records set by Plextor and TDK. Then we checked the price—$130. We quickly put away our lunches and began writing.

Although Lite-On is hardly a household name here in the states, the Taiwanese company is the fourth-largest supplier of CD-RW drives on the planet. Its drives have been OEM'd in Dells, HPs, IBMs, and Compaqs, and Lite-On has already acquired a huge western fan base, all thanks to the word-of-mouth merits of its drives (check out the Lite-On forum at **http://forum.cdfreaks.com)**.

The benchmarks speak for themselves. At 3:39, the Lite-On drive broke the record for a 647MB data CD burn and wrote the same data to a CD-RW in 6:46 (a time that would have been awesome for mere CD-R burning just a year ago). What we didn't anticipate were the unprecedented random and full-stroke seek times of 85ms and 155ms respectively. With stellar seek-time performance like this, you might experience noticeably faster disc access times, which come into play when applications need to pull data off different parts of a CD-ROM (for example, when retrieving images from a clip-art disc).

But there's more to CD-RW drives than just pure burning speed. The Lite-On 32x is, after all, just 12 seconds faster than the 24x Plextor. Whee. No, these days, audio ripping speed and quality are just as important—and in this, the Lite-On 32x also triumphed. Unlike many other high-speed drives we've tested, the Lite-On demonstrated no problems extracting digital audio even at the extremities of a 75:27 minute CD. Even better, according to *Exact Audio Copy* (which we're auditioning for our updated benchmark suite), the Lite-On returned fewer extraction errors than the 24x Plextor and TDK drives when ripping tracks from a scratched CD.

Once again, the marketing fluff behind high-speed drives is exposed: True 32x burning begins only after the second half of the disc, as indicated by the green line (the yellow line represents disc rotation speed).

In fact, the only issue we have with the Lite-On 32x is with its picky taste in media. The bundled Lite-On media returned 3:39 burns every time. But when we used 32x-rated media from TDK and Yamaha, the same burns required between 5:00 and 5:30 minutes. Evidently, the Lite-On's built-in Smart-X technology—which checks inserted media against an internal database using the ATIP identifier stamped into all recordable CDs—restricts burn speeds to what it considers safe. Smart-X also integrates bulletproof buffer-underrun protection and utilizes Zone-CLV in four zones for disc writing.

Strangely, the Lite-On drive didn't allow us to burn at any speed lower than 8x. We're not bothered by this, but we wouldn't want to see this restriction extended any further. In our experience, audio CDs burned at 8x have fewer compatibility problems with older CD players than do CDs burned at 12x or above.

The Lite-On's treatment of foreign media is really the only beef we've got with the drive, and it's a pretty minor one at that. But we're withholding a Perfect 10 verdict for a CD-RW drive that has yet to see the light of day—a drive that provides true edge-to-edge recording at a minimum speed of 24x. Until then, Lite-On gets the next-best rating. It's truly a top-of-the-line drive at a bargain price.

—LOGAN DECKER

MAXIMUM PC KICK ASS PRODUCT

THE BUNDLE

Ahead's *Nero 5.5*, Ahead's *NeroMix*

BENCHMARKS

Average data transfer (MB/sec)	4.6
Average drive rating	31.45x
Random/full-stroke seek (ms)	85/155
Audio extraction (min:sec)	3:05
Data CD burn (min:sec)	3:39
CPU utilization (at 8x)	12%

Note: The audio extraction test uses a commercially stamped 75:27 minute audio CD. The data-CD burn test uses the bundled applications to create a 647MB CD-R. For more information on how we benchmark optical drives, look at the Mag Reprints section of MaximumPC.com.

MAXIMUM PC VERDICT

Lite-On 32235
LITE-ON

INSPIRING

Don't let the price fool you—with superfast speeds and excellent digital audio extraction, Lite-On's 32x is no cheap coaster-oven.

TIRING

Um, let us think... the front bezel is rather homely.

www.liteonit.com
$130
9

Copyrighted Material

XGaming X-Arcade

Classic game controller in a tidy package

Featuring actual arcade-quality buttons and joysticks, the X-Arcade should be able to withstand all the beer and cigarette ashes you can spill on it.

We like classic arcade games. Whether it's *Defender*, *Tempest*, *Mortal Kombat*, or *Street Fighter II*, the old-school games are just plain fun to emulate on the PC, but they can be awkward to play without the right apparatus. Like the Devastator controller we gave an 8 verdict to in February, the X-Arcade includes a pair of joysticks and a bunch of buttons designed to bring the arcade experience to your home. The only thing missing is a hulking bully dropping his quarter on the machine to claim the next game. *Shucks*.

The X-Arcade comes in a stylish black case made of laminated wood and plastic. In addition to a pair of eight-way sticks, the X-Arcade includes eight buttons for each stick, all situated for right-handers. Both the sticks and buttons are durable and of sufficient quality to withstand hours of pushing, pounding, mashing, smashing, and slamming by even the most fervent of gamers. In addition to the main buttons, there are Player 1 and Player 2 buttons and a pinball flipper button on either side.

Switch-hitter: The mode switch lets you select one of the X-Arcade's four button layouts.

For fighting games (e.g., *Mortal Kombat* and *Street Fighter*), the eight-button layout of the sticks is very effective. But our experience with some other games wasn't as positive. In general, the X-Arcade works well for most any game that originally used a stick, although games that originally used *four*-way sticks, such as *Pac-Man* and *Frogger*, are trickier to control with the more sensitive eight-way sticks of the X-Arcade. Still, we'd much rather have eight-way sticks than four-ways on a multipurpose arcade rig such as this.

Our favorite feature of the X-Arcade is its programmability. The device includes a default mode that works with many *MAME* titles, but there are also three programmable modes that make it easy to set up controls for games that use non-standard button layouts. To program the X-Arcade, all you have to do is flip the mode switch on the back of the box to one of the programmable settings, hold down the button or stick position you want to change, and press a key on your keyboard to program a new action. This is especially useful if you want to use the same keyboard layout for several different *MAME* ROMs, because you'd otherwise have to manually change the settings in *MAME* for each game.

While we like the X-Arcade, it's not a perfect product. For one, we question the manufacturer's general build quality. The stick that was shipped to us arrived with a broken button, and when we hit X-Arcade's web site, we were surprised to find a page detailing the proper way to bust open the box and reconnect loose wires. Does this mean the wiring often comes loose during shipping? We hope not. We also ran into some compatibility issues with the Intel 850 motherboard in our default test system, which kept the stick from working at all. We know the motherboard was the culprit because the makers of the X-Arcade are aware of it. In fact, a USB adapter should be available shortly. When we tested the X-Arcade using other Intel and AMD boxes, it functioned just fine.

Our biggest gripe is that the X-Arcade lacks a trackball and spinner. Sure, it's great to play fighters and other games that rely solely on joysticks, but part of the fun of arcade emulation on the PC is playing games that were made with funky-fresh trackballs and spinners in mind, such as *Tempest* and *Breakout*. Shoot, in the early 1980s the Colecovision console system even *shipped* with a paddle controller to play clones of those games. Granted, those controllers don't come cheap, but we'd like to see at least an option for a more expensive but *complete* X-Arcade model.

Overall, the X-Arcade is a wholly adequate stick, especially for people who enjoy a good fighter or beat-'em-up. Rugged construction, a good price, and programmability make this a great stick for arcade emulation. The only difference between this rig and an actual arcade controller is the cigarette burn that some joker managed to leave on the second-player stick of the latter.

—WILL SMITH

MAXIMUMPC VERDICT

X-Arcade
XGAMING

+ STREET FIGHTER 2: TURBO
The button layout is grand, and everything feels nice and durable. We spent hours testing and had no problems after the initial setup.

– MORTAL KOMBAT 4
The absence of nonstick controllers isn't enough to hold this box back, but we are concerned that we had to perform surgery on our stick to get all the buttons working.

www.x-arcade.com
$200
8

Copyrighted material

Hardware Haven

Three not-so-mighty mice, a wireless keyboard, and a storage solution that will set you back

Iogear 4D Web Cruiser

The four-directional "scroll-ball" mice we've used in the past have been imprecise and unmanageable—touch one of those balls ever so slightly, and your cursor goes flying any which way but loose. But Iogear's 4D Web Cruiser performed as promised, using an optical sensor to scroll up and down *as well as* left and right, all in a pleasantly controlled manner. Mousing with the ball is especially useful for navigating large documents, such as spreadsheets, or when confined to working in a small window. A simple click of the mouse's center button summons a magnifier that can be resized to zoom in on specific areas. The 4D Web Cruiser can also double as a trackball if you've got the patience to appreciate it: Because the device is still fully mobile in trackball mode, the slightest nudge to its base can cause you to completely lose your place on screen, and the tinyness of the trackball makes index-finger activity uncomfortable over time. As with other first-generation optical-sensor mice, the Web Cruiser will not serve you well in gaming. It does, however, attach to either a USB *or* PS/2 port.

NIFTY: The ability to scroll in four directions comes in handy.

NAUSEATING: The small, light mouse is too easy to accidentally move, making this a frustrating trackball. As for gaming: *fuhgedaboudit.*

—KATHERINE STEVENSON

MAXIMUM PC VERDICT: 7

$30, Iogear, www.iogear.com

Sony 128MB Micro Vault

Plug it in. Load it with files. Take it out. Ever since we went bananas over M-System's DiskOnKey (September 01), we've been brazen enough to declare flash-memory-on-a-USB-stick as our favorite floppy replacement option. Now Sony's delivered its own version, the Micro Vault, in a formfactor that's both slimmer and sexier than the other guy's. Peer inside the smoked plastic casing and you'll see a tiny CPU looking back at you. That's the ARM-7 processor, and it's the reason why the Micro Vault doesn't require any drivers on a PC running Win98SE or later. The device is automatically recognized as a Mass Storage Device and assigned a drive letter just moments after you pop it in. There's also a preloaded app that allows you to create a password-protected partition over a specified amount of memory. At 128MB, the Micro Vault can replace a lot of floppies—89 of them, to be exact. However, at $300, it costs about as much as 1,765 floppy disks. The DiskOnKey costs half as much.

SWELL: The Micro Vault requires no drivers and can be used in any computer with a USB port, even a Macintosh.

HELL: It's heinously expensive, although modest budgets can get 16, 32, and 64MB versions instead.

—LOGAN DECKER

MAXIMUM PC VERDICT: 7

$300, Sony, www.sony.com

Microsoft Wireless Desktop

Hot on the heels of Logitech's Cordless Freedom Optical, Microsoft is trundling out its own wireless keyboard and mouse duo. The Wireless Desktop uses a dual-channel radio frequency transmitter/receiver that plugs into your PS/2 mouse and keyboard ports, freeing valuable USB slots in the back of your PC. Like the Cordless Freedom Optical, the effective range is just less than six feet, even in the electromagnetic fury of our Lab. The keyboard itself is extraordinarily comfortable, with a slightly concave surface that makes typing punctuation and reaching the function keys less of a gymnastic exercise. Ten unobtrusive, re-assignable hot keys are distributed over the function keys and numeric pad. The wrist rest sits at a perfect angle, and each key has a satisfying throw. The "ambidextrous" mouse, however, is so uncomfortable, we suspected we might have received the Mac version by mistake. First, it's too flat and small for our tastes. Second, buttons flank both sides, but unless you use your mouse with an arched hand, you're going to have a hard time using either side. Third, the wireless mouse is mechanical instead of optical, and doesn't track fast enough for gaming.

ENERGIZING: One of the most satisfying keyboards we've ever used.

ENERVATING: The mouse is too awkward for daily use, too slow for gaming.

—LOGAN DECKER

MAXIMUM PC VERDICT: 6

$75, Microsoft, www.microsoft.com/hardware

Belkin Nostromo n30 Game Mouse

Sometimes, when you first grip a new mouse in your hand, it fits so well and moves so smoothly it feels as if it's a part of your own body. Unfortunately, the n30 is not one of those mice. On first glance, the n30 has all the requisite ingredients: three buttons, a scroll wheel, and nifty force feedback, courtesy of the same great Immersion technology used in the Logitech iFeel mouse. The problem with the n30 is its unwieldy and just plain uncomfortable design. Instead of a traditional shape that actually fits well in your hand, Belkin chose an industrial design that looks like something out of a sci-fi movie. The hearthstone of this design is the BattleWing, the silver thing on the right side of the mouse that is home to mouse button three, eschewing the traditional spot between buttons one and two. This means it's really difficult to push either of the two main buttons and the third button at the same time. Also perplexing is Belkin's decision to use a traditional ball design instead of an optical sensor. We prefer optical sensors to old-school mechanical sensors any day. We've not cleaned a mouse in about two years, and we don't want to start up again now.

DOOM: We groove on force feedback in mice.

MORTYR: Poor design and utter disregard for ergonomics cripple this mouse.

—WILL SMITH

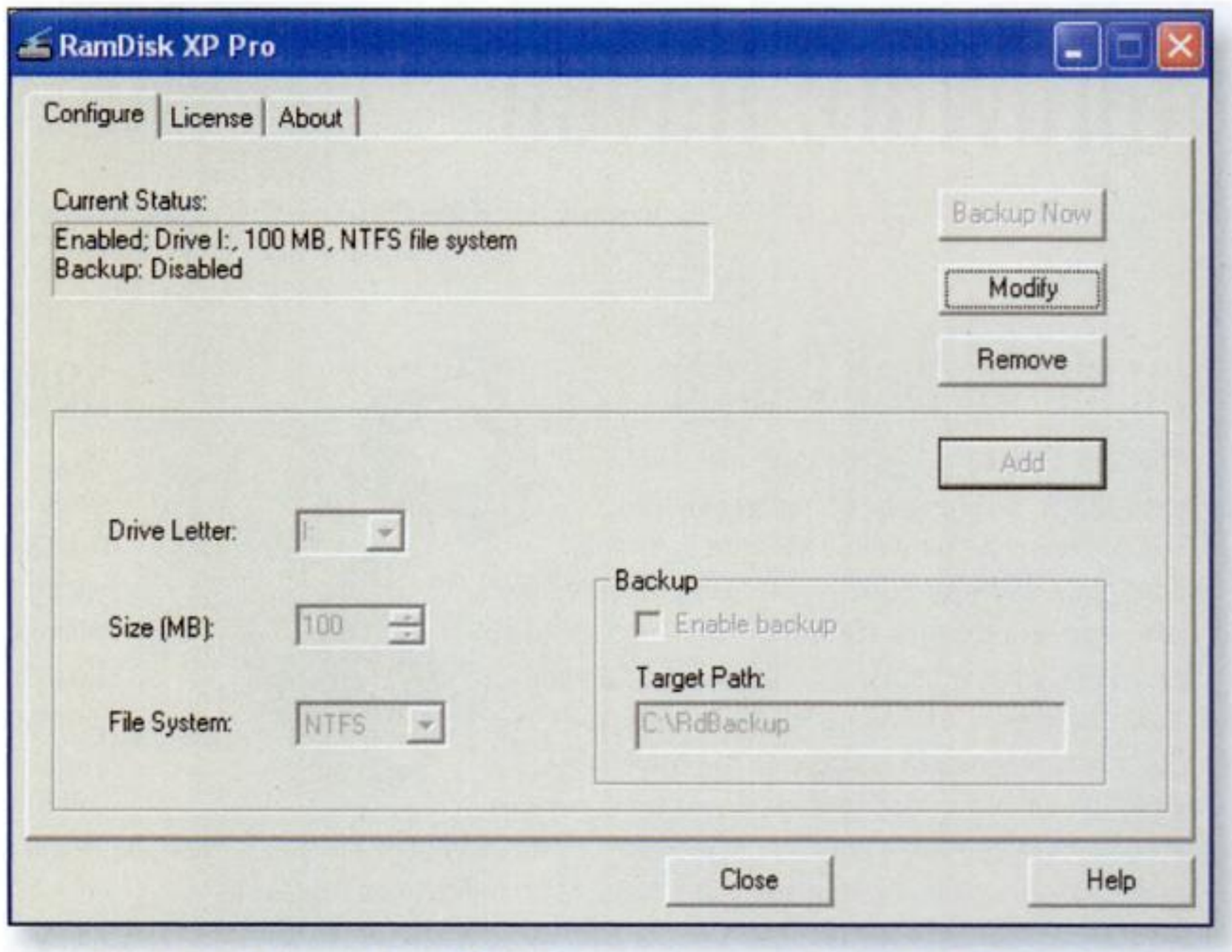
MAXIMUM PC VERDICT: 5

$46, Belkin, www.belkin.com

Reprinted material

RamDisk XP Home

Superfast storage for gambling types

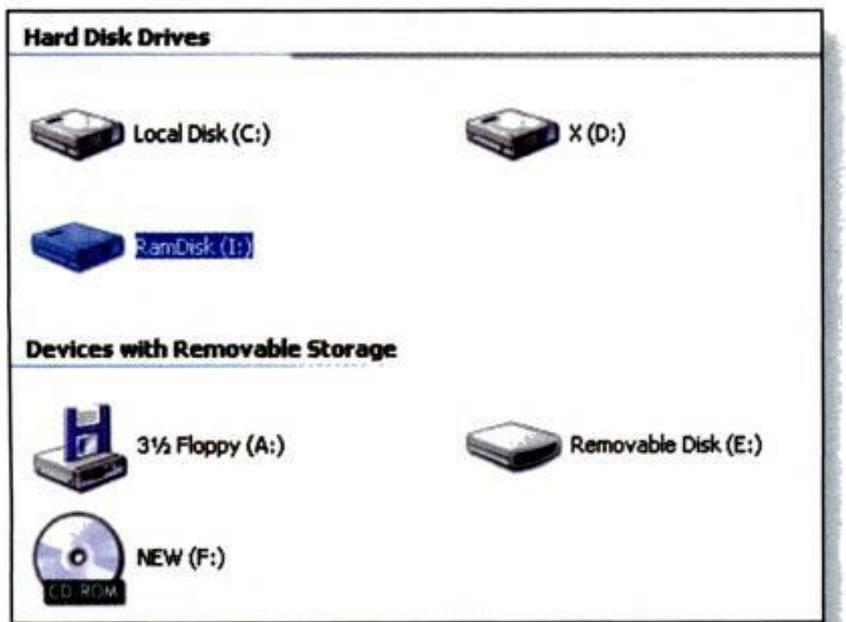


***RamDisk XP's* simple interface lets you control your RAM disk's size, format, and letter, and tells you the current status of your disk.**

Are you sick of the time it takes to load gigantic audio files? Tired of waiting for *Photoshop* to complete its dawdling load-up routine? Long map-loading times in *Quake III* got you down? A RAM disk—such as one created by *RamDisk XP*—might be just the cure to the load-lagging blues.

A RAM disk is a virtual storage drive—a drive that uses system memory for storage instead of the magnetic platters of a hard drive. Its main advantage is marvelous, stupefying, liberating speed. For example, when you request a piece of data from a standard 7200rpm hard drive, it might take around 8ms (that's milliseconds) to retrieve the data from the drive. But even PC133 SDRAM can access data in 8ns (that's nanoseconds). Now dig this: There are 1,000ns in 1ms. Beginning to get the picture? Indeed, even archaic SDRAM is exponentially faster than the fastest IDE hard drives available today. Factor in the low, low price of today's memory and the fact that Windows XP supports up to 4GB of RAM, and you can see how beneficial it might be to add a few hundred megabytes of memory to your system to serve as a RAM disk.

There are a few problems with using RAM disks, however. First, your system memory is volatile—once you shut down your system, all the data stored in the RAM disk is purged. This means you'll lose data in the event of a system crash or power outage (for this reason, we recommend that all RAM disk users invest in an uninterruptible power supply). Luckily, *RamDisk XP*, like most good RAM disk software, can save whatever's stored on the RAM disk to a physical disk when the PC shuts down, then restore that data to the RAM disk when the machine comes back online.



Just like any other hard drive, our RAM drive shows up in My Computer.

Second, using a large RAM disk can add a significant amount of time to your boot and shutdown processes. Of course, if you want to get on the RAM disk bandwagon, you'll need a modern processor (P-III or higher) and enough RAM to make the size RAM disk you want, plus enough memory to run your apps and OS (about 128-200MB).

That said, a RAM disk *should* speed up your application loading times. Using *RamDisk XP*, we installed *Photoshop 6.0* on a 400MB RAM disk and measured the time it took to fully load. The granddaddy of all image editors loaded in about 4.5 seconds when we ran it off the hard drive, but came in half a second faster when we installed it on a RAM disk. We were also able to minimize *Quake III* level-change times by about 33 percent—from 15 seconds to 11 seconds—by installing *Quake III* on the RAM disk.

Of course, not everyone will have enough "extra" system memory to create a RAM disk that can support the payload of a full application. But if you have files you access frequently and would like to have faster access to them, then placing them on a more modestly sized RAM disk can improve your access times. Just be aware that these gains are only fractions of a second for files smaller than 100MB. Ideally, RAM disks work best for serving databases, high-traffic web sites, and other applications that require thousands of disk accesses.

RamDisk XP will help you set up a RAM disk on your own PC. It can use all the available physical RAM that's not being used by the OS. Using a rig loaded with Windows XP Home, we tested the software with 256MB, 512MB, and 1GB memory configs and were able to make an 850MB RAM disk without any problems. In short, the software worked just as advertised.

The only feature we'd like to see added to *RamDisk XP* is an auto-save feature that dumps the contents of the RAM disk onto the hard drive every 20 minutes, and also before the system's shut down. In the current version, you have to manually tell the software when to back up the contents of the RAM disk. If you reboot the machine and forget to press the Backup Now button, then all the data stored on the RAM disk is lost. An auto-save feature is present in *RamDisk XP Professional*, but unavailable in the consumer version—a crying, if not criminal, shame.

—WILL SMITH

MAXIMUMPC VERDICT

RamDisk XP Home
SUPERSPEED SOFTWARE

+ SMOKEY AND THE BANDIT

Faster-than-lightning drive performance makes *RamDisk XP* the only choice for anyone who seriously uses his or her hard drive.

– BJ AND THE BEAR

The lack of an auto-save feature hurts an otherwise excellent product.

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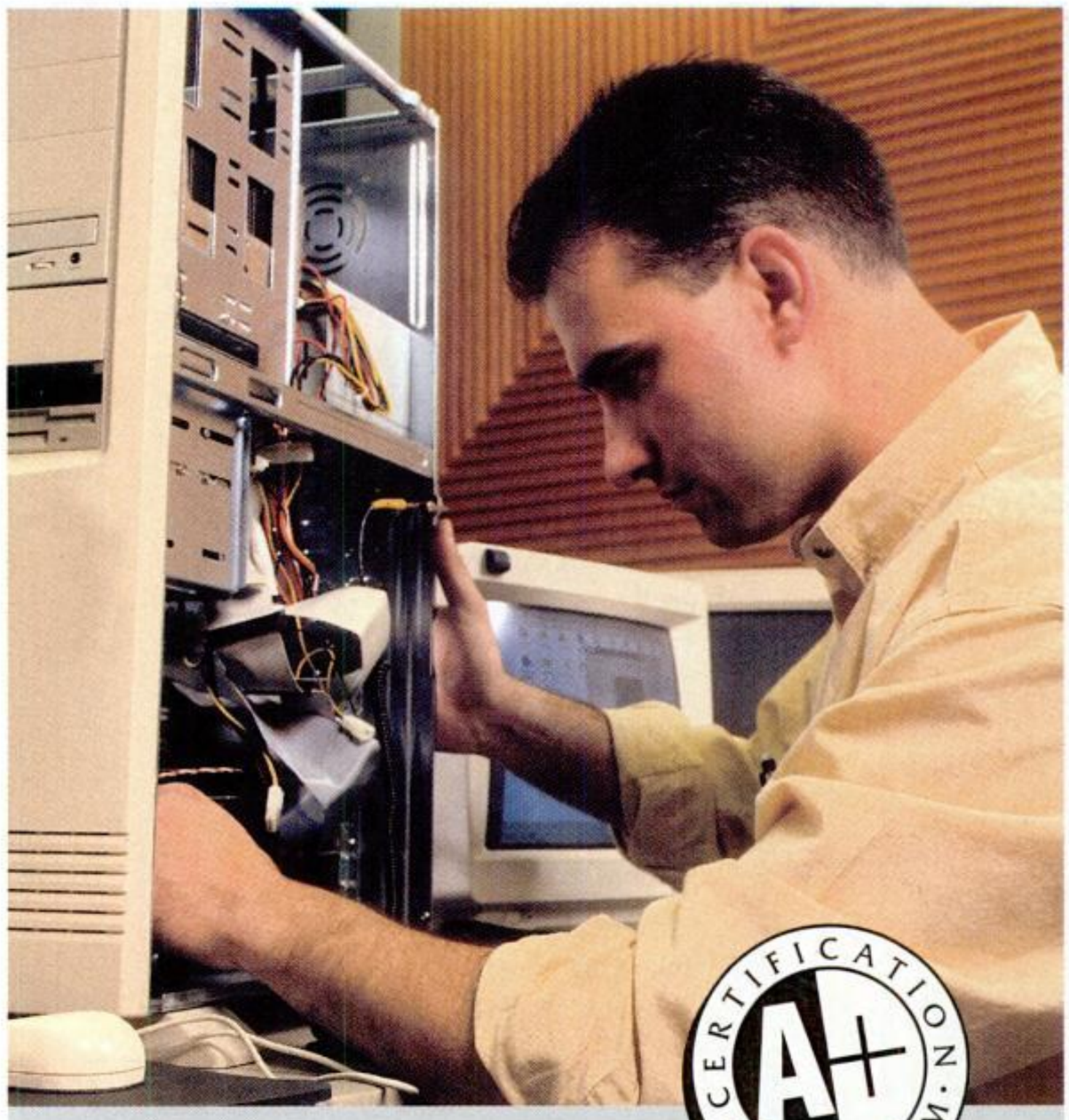

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Sid Meier's SimGolf

Little people playing with their little balls

Landscape options offer a good mix of desert, tropical, rocky, and pastoral terrain.

The bargain bins full of crummy "tycoon"-style games should be evidence enough that the business management genre isn't easy to pull off. *Guano Tycoon! Lint Tycoon! Used Axle-Grease Tycoon!* The world of golf has already been dragged through the low-end of this development gene pool with the dismal *Golf Resort Tycoon*, so potential guilt-by-association is what may have compelled Sid Meier—the very father of tycoon games—to ditch the tycoon label in favor of Will Wright's license to print money: the *Sim* line.

SimGolf isn't a golf sim (Maxis has already taken a run at that genre, with lamentable results). Instead, *SimGolf* is a golf *course* sim. You build and manage a golf resort. You can even play on it! The game is remarkably simple in its essentials, pitching overboard almost all the complex trappings of economic sims. Yet despite its simplicity—or probably because of it—the game remains fun and engrossing even after hours of play.

In true tycoon/*Sim* fashion, *SimGolf* provides an empty plot of land and the tools to build a golf resort from scratch. You can play in either the open-ended "sandbox" mode, building your course at will without limitations or money concerns, or in the main game mode, which has a modest money management aspect. Your initial plot of land is small, but can be expanded by purchasing adjoining plots (more on this later). With the money left over from buying land, you can usually build two or three starting holes, as well as a snack bar or perhaps a pro shop.

Each golfer is unique, with a different type of game and personality that will effect how he responds to the course.

Hole construction involves simply placing different kinds of terrain blocks on the screen, routing a course from tee to green, and breaking it all up with bunkers, water hazards, trees, rough, and vegetation. Each hole is rated for its quality, with the best holes playable by golfers of varying skill levels. A course that's too simple or unattractive will rate low and fail to generate income. A course that's too difficult will anger golfers and drive them away.

Income is generated by greens fees and memberships. As you earn money and lay out more holes, additional buildings and land become available. Money can also be earned by the course pro, a highly customizable character who can compete in tournaments or against other golfers for money. As the pro, you can actually "play" the course.

The game's pacing is quite good, making you focus on developing a tract before expanding. New land can be bought only from the Commissioner after he plays a satisfactory round of golf. However, in one of the game's little interface flaws, the Commissioner's offer can be irretrievably lost by a wayward click, forcing you to wait for another full round of golf. There are other interface quirks as well: Tiles can only be laid one at a time, with no ability to click and drag to lay larger tiles swaths. Neither the printed onscreen thoughts of the golfers nor their "Simlish" gibberish comments can be toggled off (each golfer is unique and can engage in elaborate conversations on the course). Closing and rerouting a hole also proved difficult, because the game reads each new tee placement as a new hole. We also couldn't get the Tab key to rotate objects the way it should. Finally, the interface is limited to 800x600!

Overall, however, these are pretty minor issues that don't detract from the sheer fun of the game. Even if you *hate* golf, you'll find yourself hooked on the course building and characters of the game. The emphasis is on creativity, not money management, making *SimGolf* perhaps the world's most entertaining landscaping simulation.

—THOMAS L. MCDONALD

MAXIMUMPC VERDICT

SimGolf
ELECTRONIC ARTS

EAGLE

Offers a large canvass and full palette of tools for creating a golf resort, yet it's simple to use. Has plenty of character, thanks to the customizable pro and wide array of golfer characters. Strategic golfing element is unique to golf simulation.

DOUBLE-BOGEY

Some interface, routing, and audio glitches. At 800x600, the resolution ceiling is painfully low. Money management element might be too light for someone expecting a true "management" sim.

www.simgolf.ea.com
$40
8

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Software Freak of the Month:

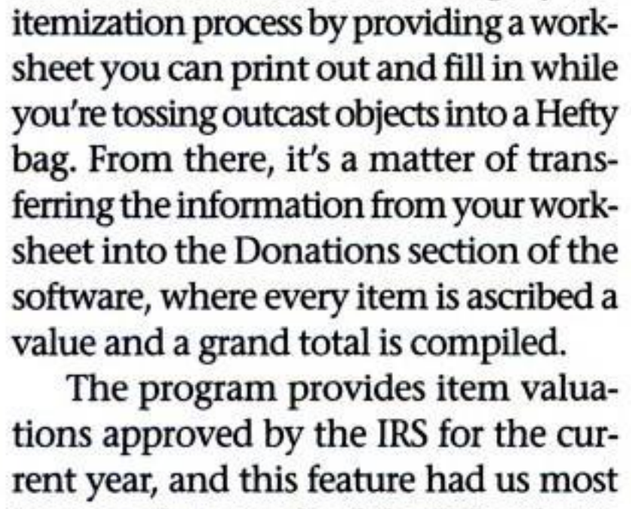
It's Deductible

What good is giving if you're not getting something back in return?

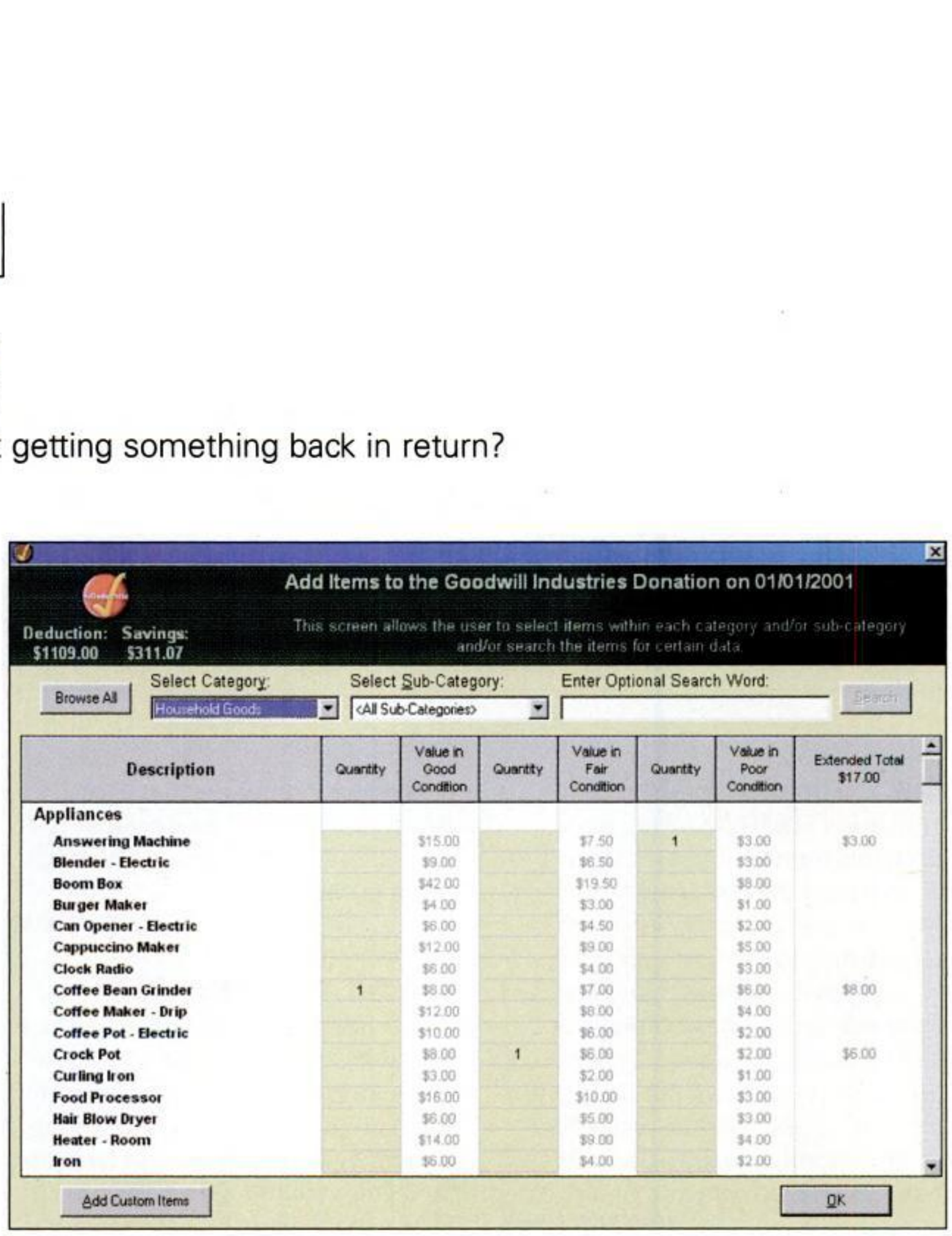
You can call it one of the most cynically titled pieces of software ever, but we call it binary gold. When we received our copy of *It's Deductible*, we immediately began to envision all the stuff we'd buy with our huge tax rebate checks... a tropical vacation, a basket of fine cheeses and meats, a change of clothes for the Lil'est Intern. After all, it's hard not to fall under the spell of claims like, "Save $100 on your taxes or your money back!" But actually turning non-cash donations into dollars—the primary intent of the application—is itself a sobering chore.

To get the most out of this program (and by "most" we mean money, of course), you'll need to have itemized all the bric-a-brac, books, and unwanted clothing you've donated throughout the year—this isn't a program you can whip out the night before your tax return is due. But *It's Deductible* does simplify the itemization process by providing a worksheet you can print out and fill in while you're tossing outcast objects into a Hefty bag. From there, it's a matter of transferring the information from your worksheet into the Donations section of the software, where every item is ascribed a value and a grand total is compiled.

The program provides item valuations approved by the IRS for the current year, and this feature had us most impressed. A search of the IRS web site turned up a lengthy discourse on the difficulty of determining Fair Market Value, and some windy spiel about donated goods being worth what they would fetch at a garage sale or flea market. But nowhere could we find actual numbers.



Would you believe this pile of hand-me-downs has an IRS-estimated value of more than $1,000?!


Add Items to the Goodwill Industries Donation on 01/01/2001
Deduction: $1109.00
Savings: $311.07
This screen allows the user to select items within each category and/or sub-category and/or search the items for certain data.
Browse All
Select Category:
Household Goods
Select Sub-Category:
<All Sub-Categories>
Enter Optional Search Word:
Search
Add Custom Items
OK

Description	Quantity	Value in Good Condition	Quantity	Value in Fair Condition	Quantity	Value in Poor Condition	Extended Total $17.00
Appliances							
Answering Machine		$15.00		$7.50	1	$3.00	$3.00
Blender - Electric		$9.00		$6.50		$3.00	
Boom Box		$42.00		$19.50		$8.00	
Burger Maker		$4.00		$3.00		$1.00	
Can Opener - Electric		$6.00		$4.50		$2.00	
Cappuccino Maker		$12.00		$9.00		$5.00	
Clock Radio		$6.00		$4.00		$3.00	
Coffee Bean Grinder	1	$8.00		$7.00		$6.00	$8.00
Coffee Maker - Drip		$12.00		$8.00		$4.00	
Coffee Pot - Electric		$10.00		$6.00		$2.00	
Crock Pot		$8.00	1	$6.00		$2.00	$6.00
Curling Iron		$3.00		$2.00		$1.00	
Food Processor		$16.00		$10.00		$3.00	
Hair Blow Dryer		$6.00		$5.00		$3.00	
Heater - Room		$14.00		$9.00		$4.00	
Iron		$6.00		$4.00		$2.00	

An itemized list of commonly donated goods and their worth makes the accounting of your donations easy.

The *It's Deductible* software, however, lays out an extensive list of commonly donated items, along with their worth in various states of condition. A cursory sweep of our own unwanted possessions—a bag of books, some random kitchen appliances, two bags of clothing, a bag of shoes and belts, and a broken vacuum cleaner—was worth $1,047 in the eyes of the IRS! We even learned that a pair of baseball stirrup socks in fair condition is worth $2. And to think, we looked upon all this stuff as junk. Total tax savings to us: almost $300!

And the mileage it takes to transport all those goods to a charity? It's also deductible! To the tune of 14 cents a mile. In fact, we learned that the transport rule applies anytime you use your car in the service of any nonprofit organization—say, driving to perform volunteer work—just so long as there's no "significant personal pleasure, vacation, or recreation involved" in the charitable travel.

Besides offering helpful hints and handy itemization worksheets, the program can print reports for your own records and prepare appropriate tax forms for the IRS. The special "Stewardship Edition" is unique in its ability to track your tithe (the percentage of your salary that goes to your church), and even offers a complimentary version of *QuickVerse*, which treats you to random Bible passages relating to charity. For instance, you might open a window and find yourself spurred on by Proverbs 13:11: "Dishonest money dwindles away, but he who gathers money little by little makes it grow."

Honestly, unless you donate high-ticket items such as furniture or large appliances, making money off of rummage does happen little by little, and requires diligence and good record-keeping. Still, as we learned, it can pay off.

—KATHERINE STEVENSON

MAXIMUMPC VERDICT

It's Deductible Stewardship Edition
INCOME DYNAMICS

DIVINE

Easy to use, and way more profitable than a garage sale.

DAMNATION

The upgrade version containing revised IRS valuations costs nearly as much as the original version.

www.itsdeductible.com
$40, full; $35, upgrade version

9

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Reader Reviews

Buy it, try it, and tell us what you think

This Month: IBM 60GXP Hard Drive

In December 2001, we gave IBM's latest flagship IDE drive a Gear of the Year Award for its record-breaking average transfer rate of 38.4MB/sec and unprecedented areal density. But with just about a month of testing under our belts, we didn't have enough time to verify if the 60GXP erases all the questions posed by the notoriously failure-prone 75GXP. While some of our readers praised the drive's performance, a significant number sent in negative reviews, which just goes to show that not all hard drives in the same family are created equal.

No Complaints Here

I ordered a 60GB 60GXP for about $160 this summer. Fantastic drive. I downloaded the IBM setup utility, which was an extremely easy way to replace my old Western Digital drive. Not only is the drive nice and fast, it's extremely quiet. I was worried that I had gotten a bad Western Digital drive because it was so loud, but I can't even hear the 60GXP over the case, CPU, and northbridge cooling fans in my box. I highly recommend this drive.

—BENEDICT EIYNK

The Jury is Still Out

In a nutshell, my drive rocked, then rolled—over dead! It was quiet for being a 7200rpm drive, and ran relatively cool. I noticed right away that the drive was very sensitive to having its power cable touched or moved at all. The slightest bump would reset the drive. After about a month of use, it began making a tick, chugga, chugga, chugga sound at power-on. Reseating

or replacing cables would get it to boot, but I knew it was short for this world. It finally reported bad sectors, so I went to the IBM web site to start the RMA process. They have a utility you have to run first to get the failure code for the RMA. The utility performed a low level format, which took care of the bad sectors for a while. The drive ran another month or so until developing the tick, chugga, chugga, chugga sound again. This time I completed the RMA form and sent off the drive for repair/replacement. IBM received the defective drive on 1/9/2002, and I received my new 120GXP on 1/22/2002. Not a bad exchange! Ultimately, I think I had a defective drive from the start. I will, however, wait to purchase another IBM drive until I have a chance to thoroughly test the new one.

—COREY MINOR

I'm All about the IBM

Boy, is IBM taking a beating with these hard drive issues. I've read all over the place, including on some IBM forums, about all the tit for tats. Honestly, I'm amazed by how many people have had problems with IBM drives. Then again, I have no doubt that if I were to probe any manufacturers' forums, I'd see the same. Anyhow, I installed the new 40GB 60GXP in my self-built Dream Machine, and to tell it like it is: It's the best hard drive experience I've had.

I already own an IBM 3.4GB. Not a damn thing wrong with it yet. I also own an IBM 8.4GB. To this day, there is not a damn thing wrong with it. No, I don't work for IBM in any fashion. I just felt a need to express my experience with its products. And, yes, the company has software issues I don't agree with. Its programming has been removed from all my IBM hard drives. But I love my IBM 60GPX.

—BILL DEGAYNOR

On Second Thought...

When I first got this 60GB hard drive, I thought it was the greatest. Well, I thought wrong. It all started a few months after I bought the drive. I installed Windows 2000 on an NTSF format. My system ran flawlessly. Then, after a few weeks, I rebooted because my hard drive sounded like a chainsaw. When I reached the sign-on screen (which usually never happens), I typed in my password and was unable to log in. So, I tried my other two accounts, with no luck. Then I tried the almighty admin account, and to my surprise, no luck. I couldn't figure out what caused this. Later I learned it was a bad cluster. So I redid my system using FAT32. With this setup, my computer ran fine for four months. Then I decided to switch to NTSF format with the help of *Partition Magic*. Low and behold, three days later, my programs started getting errors. I also got many errors on Disk Check.

—MATT JAMIESON

Humble Beginnings

I've owned a pair of these drives for eight months, and I'm very happy. I purchased these drives because of the positive feedback in *Maximum PC*. I went with a Promise Fastrack TX2 RAID controller and placed the drives in a striped configuration. Initially, I was disappointed with the performance of the drives, and found they preformed just slightly better than a single drive. Several months later, one of the drives failed. I'm assuming it was an electronics failure because the system still recognized the drive. However, no data was accessible or recoverable.

I called IBM, and after running a diagnostic as suggested, I returned the drive for a replacement. Now, after running the two working drives for a couple months, I can say that these drives ROCK. I have finally reached the performance level I was expecting. I believe that the drive that went bad was defective from the get-go and really should have been caught at the factory. There was no need to have such a serious failure on a premium drive. With that, I would probably give these drives a 7 rating—4 for reliability, but a 10 for performance. On a final note, another machine I built is running the same RAID setup, but with Maxtor drives instead. The performance is not near that of the IBM setup, but they have been more reliable.

—RUSS RAYMOND

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  Black Floppy Drive 1.44MB
  40GB 7200RPM Ultra ATA100 Hard Drive
- **NVIDIA® nForce™ Integrated GeForce2 with 256-bit Graphics Core**
  Koolmaxx™ Video Cooling System
  SoundBlaster® LIVE!™ 5.1 Sound Card
  Creative® Inspire™ 5.1 5300
  Speaker & Subwoofer System
  16X/40X DVD-ROM Drive
  Black Dragon Full-Tower ATX Case 340-Watt PS
  Black 107-Enhanced Keyboard
  Microsoft® Intellimouse Explorer
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- **Dual AMD Athlon™ MP Processors 1900+**
  with QuantiSpeed™ Architecture outperforms competitive 1.9GHz processors
  QuantiSpeed™ Architecture operates at 1600MHz
  High-Performance Heatsink/Cooling System
  AMD 760™ MP Motherboard
  512MB DDR SDRAM (PC-2100)
  Black Floppy Drive 1.44MB
  18GB 15,000RPM Ultra160 SCSI Hard Drive
  Adaptec SCSI 32Bit/Dual Channel Ultra160 Controller
- **NVIDIA® GeForce4™ Ti 4600 128MB DDR**
  Koolmaxx™ Video Cooling System
  SoundBlaster® LIVE!™ 5.1 Sound Card
  Klipsch® ProMedia™ 5.1 THX 500-Watt
  Speaker & Subwoofer System
  16X/40X DVD-ROM Drive
- **Plexwriter 40X/12X/40X CD-RW IDE**
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  Black 107-Enhanced Keyboard
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AMD Athlon™ MP

Prices, configurations, and availability may change without notice. Actual case may vary in design. Eight custom colors available.

nVIDIA GeForce4

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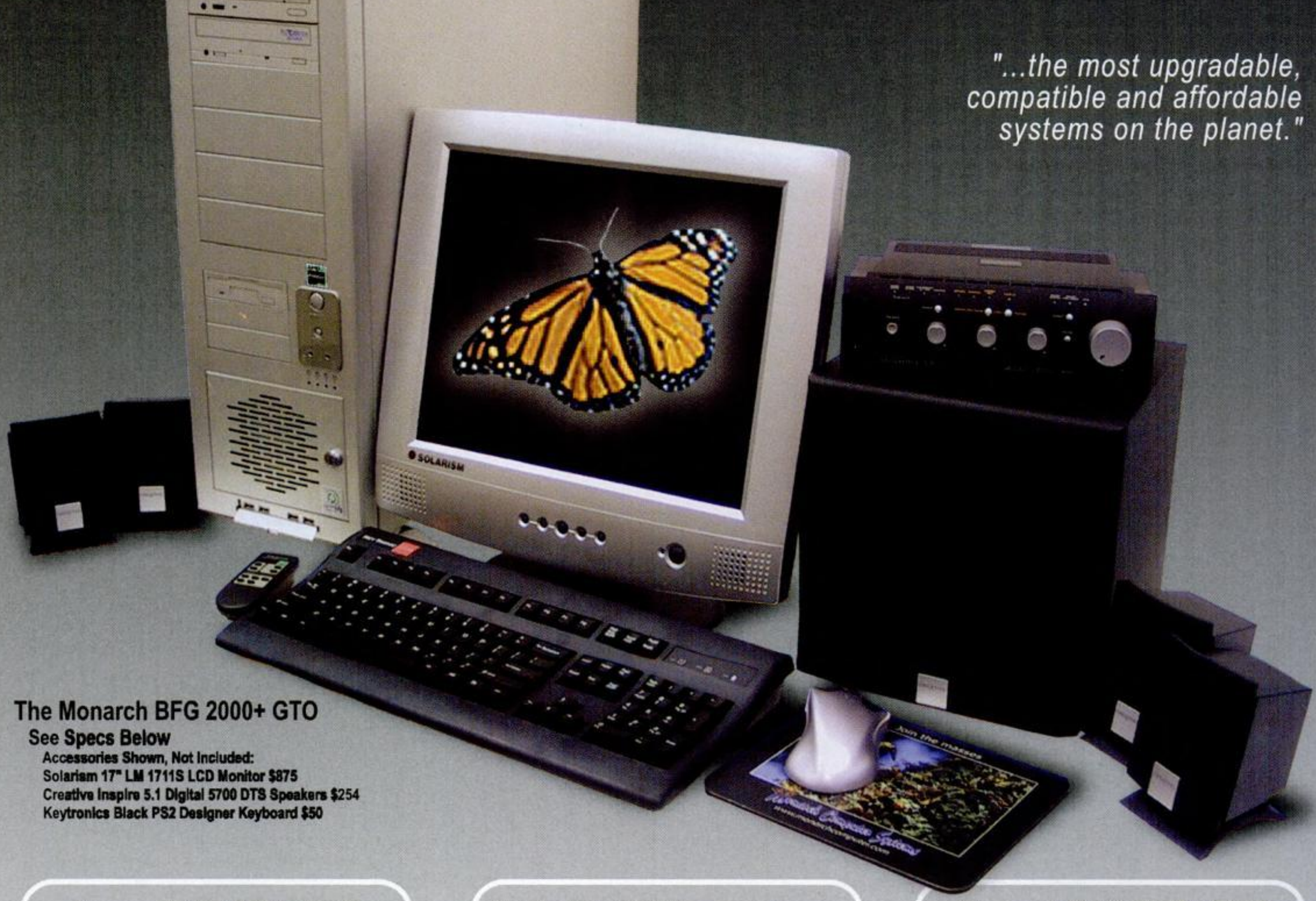

The Monarch BFG 2000+ GTO
See **Specs Below**

Accessories Shown, Not Included:
Solarism 17" LM 1711S LCD Monitor $875
Creative Inspire 5.1 Digital 5700 DTS Speakers $254
Keytronics Black PS2 Designer Keyboard $50

Monarch XP 1700+ DVD
Part # 90005

Mid-Tower with 300Watt ATX Power Supply
DFI AK76-SN AMD761/VIA-686B
266FSB DDR Motherboard
AMD Athlon™ XP 1700+ Processor
with QuantiSpeed™ Architecture*
QuantiSpeed™ architecture outperforms competitive 1.7 GHz processors.
QuantiSpeed architecture operates at 1.47 GHz
Ball Bearing Heatsink Fan
DDR 256 MB 2100 (266FSB) Memory
Western Digital 40GB 7200 RPM Hard Drive
Sony DVD 16X 40 CDROM DDU1621
1.44 MB 3.5" Floppy Drive
Creative Labs Sound Card
nVidia GeForce2 64MB AGP Video Card
Lucent 56K v.90 Modem
Microsoft Windows XP Home Edition
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4U RackZ 1700 Monarch Server
Part # 90809

ATX 19" 4U Rack Mount Server Case
320 Watt Power Supply
MSI-1394 K7 Master S DDR 6341-S Motherboard
AMD Athlon™ XP 1700+ Processor
with QuantiSpeed™ Architecture*
QuantiSpeed™ architecture outperforms competitive 1.7 GHz processors.
QuantiSpeed architecture operates at 1.47 GHz
512 MB DDR 2100 Memory
(2) Cheetah 18 GB Ultra Wide SCSI 10,000 rpm HD's
Adaptec AIC-7892 Ultra 160 SCSI Connector
and On Board IDE
Enhances Power Management Features
3Com 10/100 PCI Network Card
1.44 MB 3.5" Floppy Drive
ATI 32 MB AGP Video Card
Sony 52x CD-ROM
3 Year Warranty

$1,198.00

Monarch BFG 2000+ GTO
Part # 90754

Lian-Li PC72 Server Case
Enermax 430 Watt Power Supply
Gigabyte GA-7VTXE+ KT266A ATA133 Motherboard
AMD Athlon™ XP 2000+ Processor
with QuantiSpeed™ Architecture*
QuantiSpeed™ architecture outperforms competitive 2.0 GHz processors.
QuantiSpeed architecture operates at 1.667 GHz
AOC EC-CUC-610 Heatsink Fan
512 MB 2100 DDR FSB Memory
Western Digital 120GB 1200 JBSE HD w/ 8MB cache
Lite On 32x12x40 CDRW with CDRW Software
Sony 16x40 DVD/CD ROM
1.44 MB 3.5" Floppy Drive
Creative Labs Sound Card 5.1
Gainward GeForce4 Ultra 750X 128MB DDR VIVO
D-Link 10/100 Network Card
Lucent 56K v.92 Modem
Windows XP Home Edition
3 Year Warranty

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Cases

Lian-Li PC72 Aluminum Server $298
Lian-Li PC70 Aluminum Server $225
Lian-Li PC60 Aluminum Case $159

*Most prices represent cases without power supplies

Mid Tower ATX w/USB on Front
$32.00
Enlight Tower/Servers/Rackmount
$38-499
4U, 2U & 1U Rack Servers
$159-499

Lian-Li Clear Side
Panel For PC60
$45.00

ATX Cases $79.00
(Purple or Ivory)

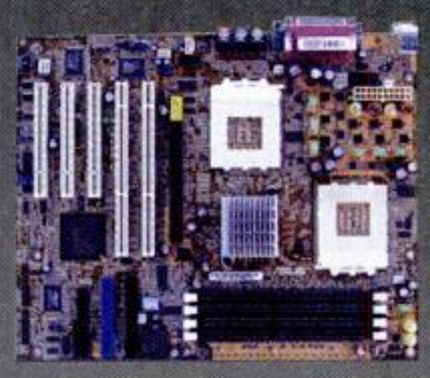
swiftech

NEW!
Liquid Cooled
Tower by Swiftech
$350

Motherboards

AMD 266 FSB SocketA	$69-89
AMD 266 FSB DDR Socket A	$75-129
AMD KT 266A DDR Boards	$79-149
Tyan Dual MPX Socket A	$169-350
SOYO SY-K7V Dragon+	$151

All Motherboards are Retail Box:
Includes - Manuals, Cables and Drivers



Asus A7M266D Dual AMD MP
$ 229.00

Hard Drives

Lian-Li RH600
SCSI Removable
$59

40 GB 7200 rpm ATA 133 HD from:	$85
60 GB 7200 rpm ATA 133 HD from:	$115
100 GB 7200 rpm ATA 133 HD from:	$205
120 GB 7200 rpm ATA 133 HD from:	$225
160 GB 7200 rpm ATA 133 HD from:	$275

Video Cards

nVidia GeForce4 MX 420	$80-105
nVidia GeForce4 MX 440	$99-120
nVidia GeForce4 Ti 4600	$295-350
nVidia GeForce4 Ti 4400	$230-245
nVidia GeForce2 32MB-64MB	$49-99
nVidia GeForce3 Ti200/500-64MB	$129-289
Cards from Matrox & ATI 8MB-32MB	$25-85
Elsa Synergy III, Gloria DCC 32MB-64MB	$355-748

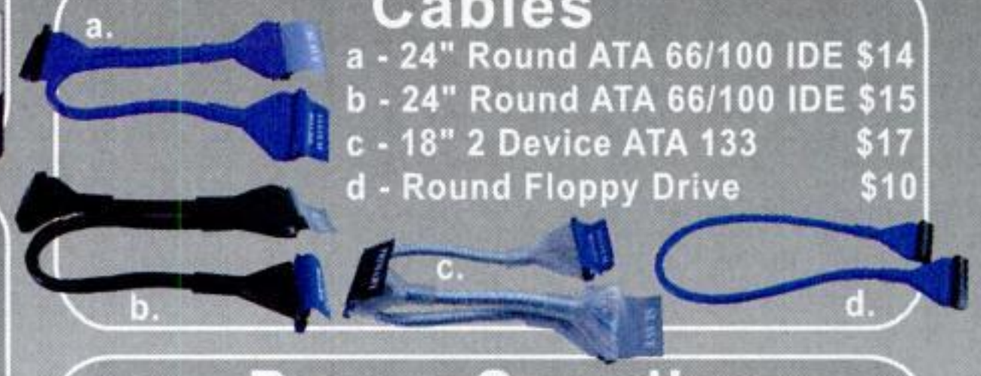
Gainward GeForce4
Pro 600TV 64MB AGP
$109.00

Additional products by: 3D Labs - Asus - ATI - ELSA - Gainward
Leadtek - Matrox - MSI - Powercolor - Vision Tek

Memory

PC133 128-256-512 MB	$19-89
DDR 2100 Corsair 256-512MB	$89-169
DDR 2400 Corsair 256MB	$115
1 GB DDR to 1 GB ECC REG Corsair	$450-499
256 MB Corsair DDR 2700	$145

Cables



a - 24" Round ATA 66/100 IDE	$14
b - 24" Round ATA 66/100 IDE	$15
c - 18" 2 Device ATA 133	$17
d - Round Floppy Drive	$10

Processors

(3 year warranty on OEM)

AMD Athlon™ XP 2000+ Processor with QuantiSpeed™ Architecture*	$229
AMD Athlon™ XP 1900+ Processor with QuantiSpeed™ Architecture*	$169
AMD Athlon™ XP 1800+ Processor with QuantiSpeed™ Architecture*	$145
AMD Athlon™ XP 1700+ Processor with QuantiSpeed™ Architecture*	$117
AMD Athlon™ MP 2000+ Processor with QuantiSpeed™ Architecture*	$290
AMD Athlon™ MP 1900+ Processor with QuantiSpeed™ Architecture*	$229
AMD Athlon™ MP 1800+ Processor with QuantiSpeed™ Architecture*	$189
AMD Athlon™ MP 1600+ Processor with QuantiSpeed™ Architecture*	$179

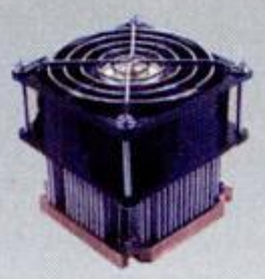
*"The AMD™ XP Processor sets a new performance standard..."

Power Supplies

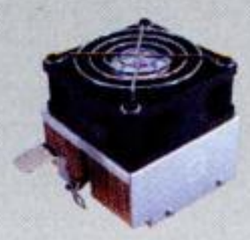
250 Watt ATX	$7-25
300 Watt ATX	$23-39
430 Watt Enermax Whisper ATX (AMD Approved)	$89
400 Watt ATX Sparkle Power Supply	$75-89
460 Watt ATX NMB (Dual Athlon Support)	$105

Thermal Solutions

Dynatron
DY1206BH
$39.00



Swiftech
MCX462/MCX478-OA
$70.00



Cooler Master
HCC-002
$42.00

Thermaltake
Dragon Orb 3
$30.00

Thermaltake
Crystal Orb
$10.00

Thermaltake
80x80x25
High Performance
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Thermaltake
Memory Cooling Kit
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40GB	7200rpm	6L040J2	$99
60GB	5400rpm	4D060H3	★ $112
60GB	7200rpm	6L060J3	$127
80GB	5400rpm	4D080H4	$151
80GB	7200rpm	6L080J4	$166
120GB	5400rpm	4G120J6	$226
160GB	5400rpm	4G160J8	$274
SEAGATE			
20GB	5400rpm	ST320410A	$80
20GB	7200rpm	ST320011A	$86
40GB	5400rpm	ST340810A	★ $82
40GB	7200rpm	ST340016A	$98
60GB	5400rpm	ST360020A	$113
60GB	7200rpm	ST360021A	$124
80GB	5400rpm	ST380020A	$151
80GB	7200rpm	ST380021A	$161
I B M			
40GB	7200rpm	07N8082	$103
60GB	7200rpm	07N6655	$124
80GB	7200rpm	07N8084	$172
120GB	7200rpm	07N8086	$283
Western Digital			
20GB	7200rpm	WD200BB	★ $80
30GB	7200rpm	WD300BB	$86
40GB	7200rpm	WD400BB	$98
60GB	7200rpm	WD600BB	★ $126
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100GB	7200rpm	WD1000BB	$209
100GB	7200rpm	WD1000BBSE	$244
120GB	7200rpm	WD1200BB	★ $255
120GB	7200rpm	WD1200JB	$290

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CDRW Drives				
12x10x32	IDE	Plextor PX-W1210TA/SW	$130	$145
16x10x40	IDE	Pacific Digital U-30105	★ $90	$130
16x10x40	IDE	Plextor PXW1610TA	$132	$147
20x10x40	IDE	Acer 2010A	$99	$139
20x10x40	IDE	Yamaha CRW2200EZ	$166	$206
24x10x40	IDE	Acer 2410A	★ $99	$139
24x10x40	IDE	Teac CDW524E/KIT	$119	$149
24x10x40	IDE	Pacific Digital U-30106	$115	$155
24x10x40	IDE	Sony CRX175A/A1	$124	$164
24x10x40	IDE	Plextor PXW2410TA/SW	$152	$167
24x10x40	IDE	Yamaha CRW3200EZ	$170	$210
32x10x40	IDE	Lite-On LTR32123	$110	$150
32x10x40	IDE	Pacific Digital Mach 32	$99	$139
32x10x40	IDE	GoldStar GCE8320BI	★ $125	N/A
32x10x40	IDE	TDK VeloCD	$165	$205
40x12x40	IDE	Plextor PXW4012TA/SW	$183	$198
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24x10x40	SCSI	Yamaha CRW3200SZ	$280	$320
DVD R Drives				
6x24x12	IDE	Pacific Digtal U30116	$367	$407
DVD Drives				
16x/40x	IDE	BTC DVD BDV316B	$63	$88
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16x/40x	IDE	Pioneer DVD Tray DVD500M	$75	$100
16x/40x	IDE	Pioneer DVD Slot DVD106	$75	$100
16x/40x	IDE	Acer DVD1648A	$80	$105
10x/40x	SCSI	Pioneer DVD305S	★ $104	$129
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36.7GB	10,000rpm	KW036L4	8mb	$360
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18.4GB	15,000rpm	ST318452LW	8mb	$300
36.7GB	10,000rpm	ST336706LW	4mb	★ $350
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	K7T266PRO		$96	K7T266PRO2		$114
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	GA8IRXP	478	$183			
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Hitachi	21"	CM828U511B	2046 x 1536 - .21 $800

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PS2000, 2 Pc Playwork Digital		22W	$168
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Sonigistix Monsoon Flat Panel Speakers			
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Amacom	60GB	EZ Disk Portable USB EZ60U	$315
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QPS		Que! 24x10x40 2.0 CD-RW	$200
QPS		Que! 32x10x40 2.0 CD-RW	$240
TDK		VeloCD 32x10x40 2.0 CD-RW	$184
USB DVD Recorders			
QPS		USB 2.0 DVD-R CD-RW QPDVRPR1U2	$580

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Sony	8GB DAT Internal	SDT-7000/BM	$459
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Sony	40GB DDS-4 Int	SDT11000BP	$925
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Sony	130GB AIT-2 Int	SDX500CTB	$1815

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ATI	Radeon AIW 32mb DDR AGP	$171
ATI	Radeon 8500 64mb AGP	$255
ATI	Radeon 8500DV AIW 64MB AGP	$335
EVGA	GeForce2 GTS 32mb w/Tv Out	$115
EVGA	GeForce3 Ti200 64mb DDR	$194
EVGA	GeForce3 Ti 64mb DDR w/Tv	$204
EVGA	GeForce4 MX440 64mb w/Tv	$124
Hercules	3D Prophet 4500 64mb AGP	$125
Hercules	3D Prophet III Ti500 OEM	$315
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3dLABS	WildCat 4110 128mb DVI	$1520
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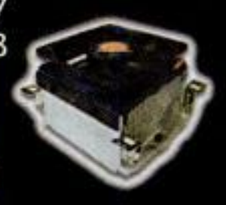

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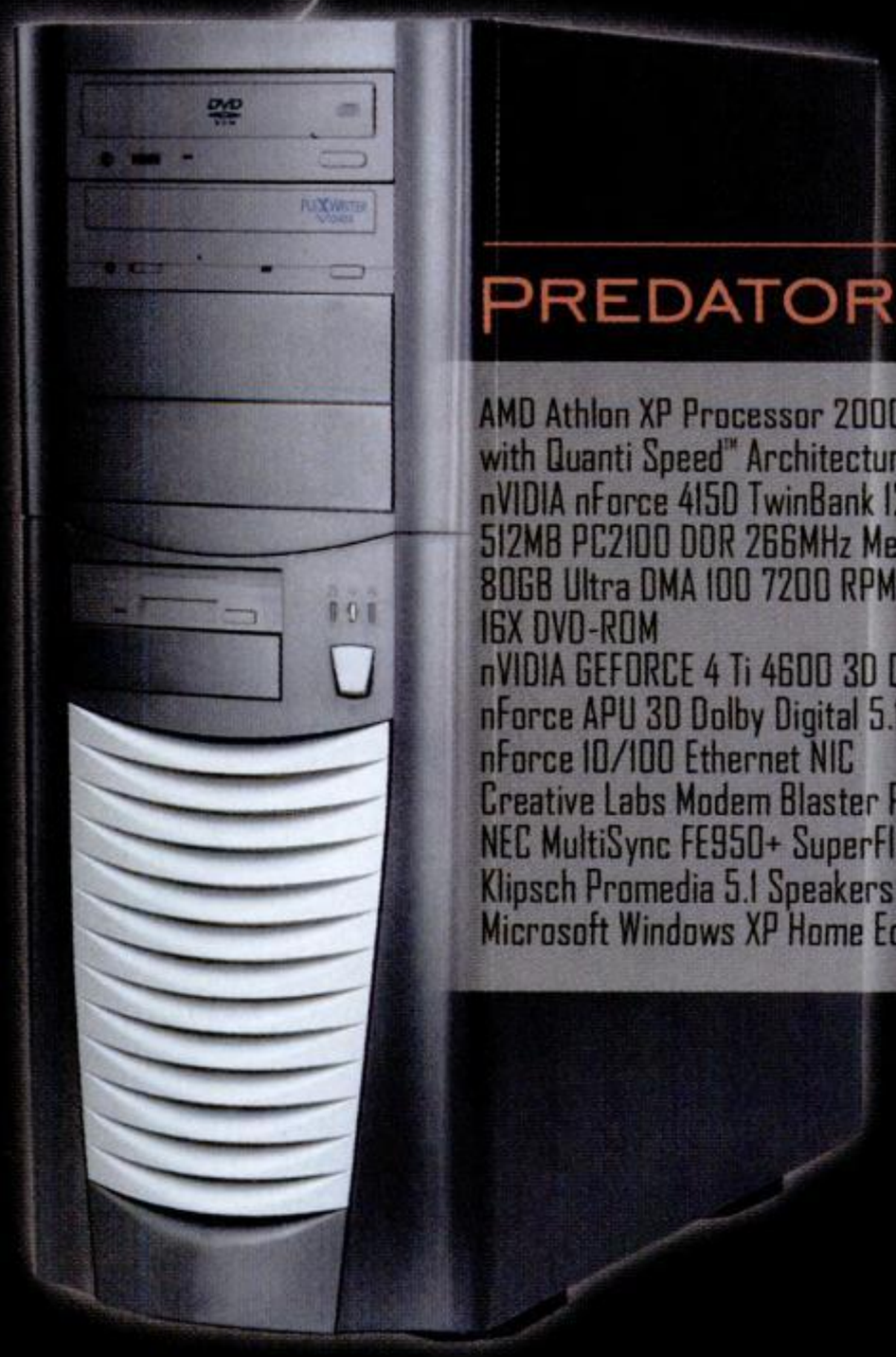

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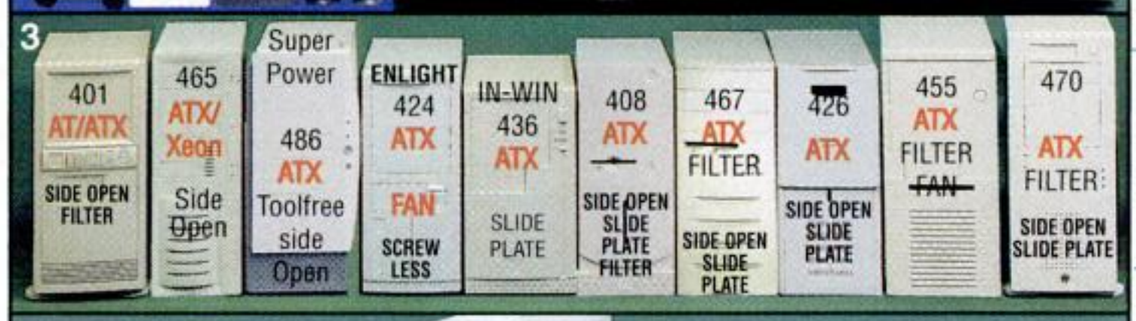
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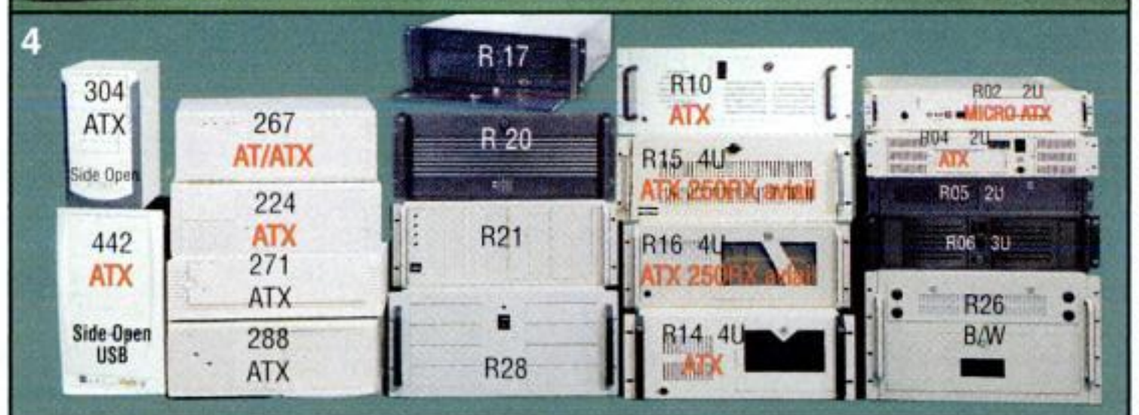

5

6

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105LPX TV	275	12x13x3.1	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME,TV	1		3 or 0	
109NLX socket 7	175	12.3x16x3.9	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME, IR	1	1/1	2 1	
111M.NLX 370	260	11.5x10.6x2.5	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO, GAME,1394	w/slim CD	0/2.5 HD	2 or 0	
192 M.ATX 370	185	13.8x16.5x3.4	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME	1	1/1	3 or 0	
192B M.ATX 370	185	13.8x16.5x3.4	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME	1	1/1	3 & 0	

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R04B/W	275	19x24.3x3.5	ATX	1/0	1/3	250W
R05B	430	19x242x3.5	ATX	1/0	1/4	430W
R06B	250	19x20.2x5.25	ATX	4/0	1/5	300W
R08 B/W	1550/1800	19x22x3.5				
R10 B	175	19x17x7	ATX	3/0	1/1	300W
R14 B/W	215	19x21x7	ATX	3/0	1/3	300W
R15	295/510	19x24.4x7	ATX	6/0	2/2	300W
R16 B/W	225	19x18x7	ATX	3/0	1/2	250W
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R21 B/W	275	19x18x7		8/0		300W
R22R/B/W	635/950	19x23.3x10.5	ATX	8/0	1/0	300W/R
R26R/B/W	630/850	19x22.6x10.7	ATX	4/0	2/4	300W/R
R28	290	19x17x8.7		8/0		300W
RSP	18	5.8x9.3x1.6			1	
RSM169-100	65/75	5.8x9.3x1.6			1	
001B	75	10x11.5x3		1/0		60W
001B1	65	8.3x10.6x2.8		1/0		50W
002B	88	6.9x14.6x5.8		2/0		60W
002B1	78	7.5x11.2x6.5		2/0		80W
004B	105	6.8x15.3x9.3		4/0		230W
004B1	100	7.5x17.3x10.2		4/0		200W
007B	180	7x15.8x13		7/0		250W
008B	280	8.4x20.2x18.3		8/0		300W
008B1	180	7.5x17.9x17.1		8/0		250W
105LPX/TV	255/275	11.9x12.6x3	LPX	1/0	1/1	90W
109(SP 98) bare	175	11x12.3x3.9	NLX	1/0	1/1	135W
111N bare	260	11.6x10.6x2.5	M.NLX	1/0	0/1	100W
192M.ATX/B	85	13.1x16.5x3.5	M.ATX	1/0	1/1	150W
224	75	17.4x18.8x6.1	ATX	3/0	2/2	230W
267	70	16.8x16.8x6.2	ATX	2/0	2/1	250W
271	85	17.3x15.9x5.5	ATX	2/0	1/1	250X
288	75	16.9x17x6	ATX	3/0	2/1	230W
304	55	7.9x18.8x13.9	ATX	3/0	2/1	300W
325B	55	8x18.5x17	ATX	3/0	2/1	235W
327	72	7.5x16.5x17.3	ATX	3/0	2/2	230W
337	75	7.8x18.8x16.5	ATX	3/0	2/2	300W
338	55	7x14.7x13.8	M. ATX	2/0	2/1	145W
366	50	7.2x15.5x14.3	M. ATX	2/0	1/1	235W
367	55	7.7x16.5x17	ATX	3/0	2/1	235W
370	80	8.3x17.3x16.1	ATX	3/0	2/2	250W
392	80	7.5x17x17	ATX	3/0	2/2	250W
393	90	9x17.5x17.5	ATX	6/0	1/1	250W
396	55	8.3x17x15.5	ATX	3/0	1/3	230W
401	110	8.5x17.3x18	ATX	2/0	2/2	250W
405B	75	7.8x17.5x17.2	ATX	4/0	2/2	320W
408	80	8.2x19.8x18.4	ATX	3/0	1/5	250W
409	295	9.5x22x18.1	ATX	4/0	2/5	300W
411	67	7.2x17.2x16.8	ATX	4/0	2/1	250W
412	67	7.2x17.2x16.8	ATX	4/0	1/2	250W
413S/BL	67	8.5x19.5x18	ATX	4/0	2/1	250W
415	75	8.8x19.5x19.7	ATX	8/0	1/0	300W
418B/W	115	8.1x18.8x21.4	ATX	4/0	2/4	300W
422	70	7.7x16.6x18.1	AT	4/0	1/4	250W
424	70	7.5x18.9x16.7	ATX	4/0	2/1	250W
426B/W/S	70/75	7.5x17.5x19.3	ATX	3/0	2/2	250W
427	75	7.5x16.5x17.3	ATX	3/0	2/2	250W
436	70/85	8.6x18x15.6	ATX	3/0	2/2	250/300W
442	60	8x18.25x16.3	ATX	4/0	2/1	300W
455	110	8.5x17.5x18.6	ATX	4/0	2/3	250W
465	185	9.3x17x17.2	XEON/ATX	2/0	2/2	300W
467	75/90	7.5x16.7x18.8	ATX	3/0	1/4	250W/300W
470	110	8.3x17.3x21.3	ATX	4/1	1/2	250W
471	110	8.4x17.5x21.3	ATX	3/1	1/4	250W
472	60	7.5x18x17.6	ATX	4/0	2/2	250W
474	285	7.8x17.2x17.2	ATX	4/0	2/2	300W
476	70	8x17.2x17	ATX	4/0	2/2	300W
478	155	7.9x18.4x16.4	ATX	4/0	2/1	300W
479	155	7.9x18.4x16.4	ATX	4/0	2/1	300W
480	195	7.8x18x16.5	ATX	4/0	2/1	300W
482B	80	7.8x19.8x17.5	ATX	4/0	2/2	250W
486	67	9.6x19.5x17	ATX	4/0	2/1	250W
489**	80	7.3x17x17	ATX	3/0	1/2	235W
492	229	8.3x17.5x17.6	ATX	4/0	3/5	300W
493B	234	8.3x17.5x17.6	ATX	4/0	3/5	300W
496	60	8.25x17.8x16.5	ATX	4/0	1/3	250W
501	155	8.25x17.2x23.8	ATX	4/0	2/4	300W
503R/B	455	14.8x20.4x18.4	ATX	8/0	2/4	300RW
503/B	295	14.8x20.4x18.4	ATX	8/0	2/4	300W
505	555	14.6x23x26.8	ATX	12/0	1/8	300W
505R	670	14.6x23x26.8	ATX	12/0	1/8	300RW
506/R	155/370	7.8x16.5x24.4	ATX	6/0	2/2	300W/R
518	145	8.1x18.5x26.5	ATX	6/0	2/6	300W
524	380	13.9x25.6x19.1	ATX	7/0	1/2	300RW
526B/W	105/120	7.5x17.5x24.5	ATX	6/0	1/4	250W/300W
528	95/110	7.5x16.5x24.8	ATX	6/0	1/5	250W/300W
536	93/108	7.8x17x24	ATX	5/0	1/5	250W/300W
538	290	8x20.5x24.5	ATX	5/0	1/6	300RW
560/R	290/445	15x24.5x23.5	ATX	11/0	2/4	300W/300R
562/R/B/W	250/470	8.7x17.9x26.8	ATX	9/1	1/0	300W/300R
563/RB/W	145/370	8.7x17.9x26.8	ATX	10/0		300W/300R
565	185	9.25x18.3x21.2	XEON/ATX	4/0	2/4	300W
568	95/110	7.5x17x22.8	ATX	5/0	2/4	250W/300W
569B/W	210	13.5x17.8x14	B/ATX	6/2	0/8	300W/300W
570/R	150/370	8.3x17.3x26.4	ATX	7/1	1/2	300W/300R
571/R	160/370	8.3x17.3x26.4	ATX	6/1	1/2	300W/300R
582	105/120	7.8x16.5x23.2	ATX	6/0	2/1	250W/300W
588	99/114	7.8x16.5x23.3	ATX	5/0	1/3	250W/300W
1620/R	950	16.5x20.3x34.3	F/ATXx2	16/0		300R

Model# Starts with:
1 for Slim Case
2 for Desktop Case
3 for Mini-Mid Case
4 for Mid Case
5 for Full/File Server Case

*Case Color: Blue, Purple, Green, Orange, Red.
**Case Color: Blue, Purple, Green, Red, Black.

Side Open: Side Panel can be removed independently
Slide Door: Sliding front door up and down
Slide MB Plate: Motherboard tray ca slide in and out form rear

MB SIZE = MOTHERBOARD SIZE • F= FULL SIZE • B= BABY SIZE
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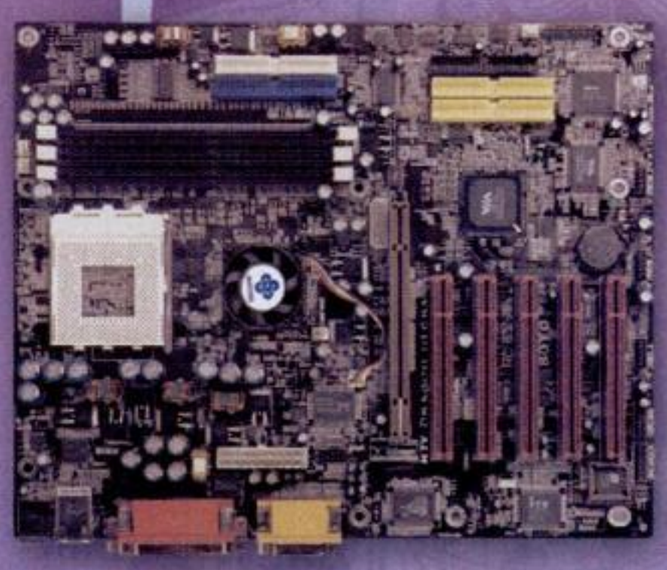

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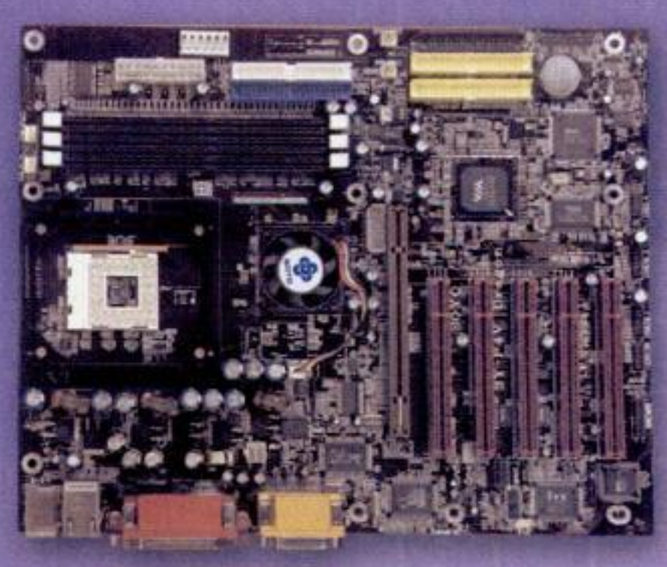

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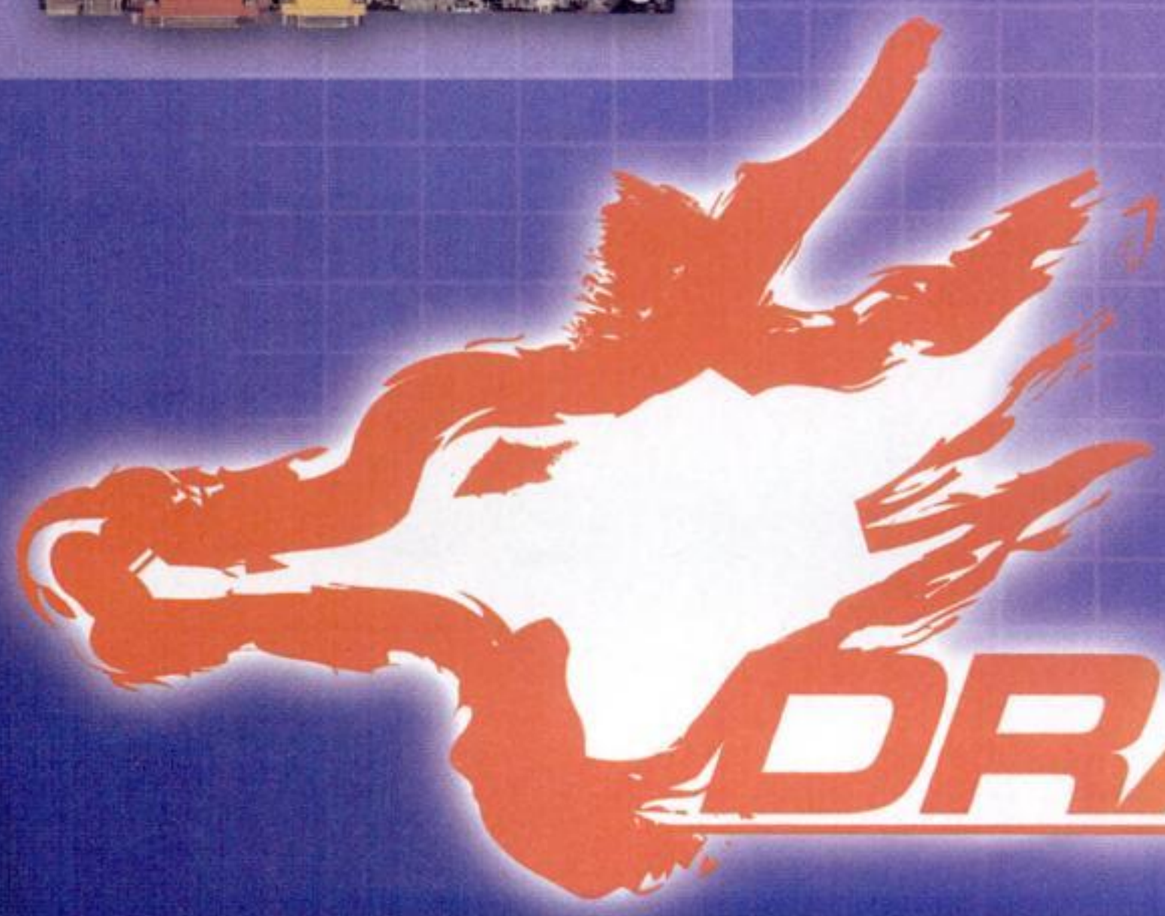

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A, 370, 7. Approved by	1.3 GHz. $111
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Western Digital 30 gig U100 7200, $106
Maxtor 20 gig U133 7200 rpm, $86
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Maxtor 120 gig U133 5400 rpm $252
IBM 20 gig U100 7200 rpm, $ 99
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Promise Ultra 133 TX2 Controller Card PCI $42
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Jaton Geforce2 MX-200 32 meg $60, MX 400 $82
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Socket A Motherboards for AMD
(AMD Athlon XP, Thunderbird and Duron)
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Asus A7V266, VIA KT266 chipset, DDR, 266bus, AGP4X, Ultra 100IDE, Audio $159
Asus A7N266, Nvidia Nforce chipset, 266bus, DDR, Ultra100, Geforce2 video $189
Tyan S2390B, VIA kt133a chipset, SDram, 266bus,AGP4x, U100 $104
Abit KG7 Raid, AMD 761 chipset, DDR, 266bus, Ultra 100 Raid, AGP4X $163
Abit KT7ARA, via KT133a chispet, 266bus, SDram, Ultra 100 Raid, AGP4x $123
Abit KR7A-Raid, via KT266 chipset, 266FSB, Raid 133, DDR, AGP4x $176
DFI AM75-TC, via KM133a, SDram, 266bus, Ultra 100, AGP4x, audio, video $88
FIC AD11-XP, AMD 761 chipset, DDR, 266bus, Ultra 100, AGP4x, audio $104
FIC AN11, via KT266a chipset, DDR, 266bus, Ultra 100 Raid, AGP4x, audio $117
Gigabyte 7VTXH, via KT266a chispet, DDR, 266bus, Lan, Ultra 100, audio $125
Microstar K7N420 Pro, Nvidia Nforce chipset, 266bus, DDR, Geforce2 video $171
Microstar K7T-266 Pro 2, via KT266a chipset, DDR, 266bus, Ultra 100, $96

Pentium 4 Motherboards Socket 478
Abit BL7, intel 845 chipset, SDram, Ultra100 Raid, AGP4x, audio, Lan $166
Abit BL7Raid, intel 845 chipset, SDram, Ultra 100 Raid, AGP4x, Lan $166
Abit BD7 Raid, intel 845 chipset, DDR, Ultra 100 Raid, AGP4x, Lan $172
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Intel D850MVL, intel 850 chipset, RDRam, Ultra 100 IDE, Lan, Audo, AGP4x $171
Asus P4T-E, intel 850 chiset, RDRam memory, AGP4x, Ultra 100 IDE $183
Asus P4B266, intel 845 chipset, DDR, Audio, USB 2.0, Ultra 100 IDE, AGP4x $187
Soyo P4ISR, intel 845 chipset, SDram, Ultra 100 Raid, Audio, AGP4x, $172

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SDram 168 pin Dimms by Micron

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AMD Duron 850 MHz. $209
AMD Duron 900 MHz. $214
AMD Duron 950 MHz. $219
AMD Duron 1.0 GHz. $229
AMD Duron 1.1GHz $244
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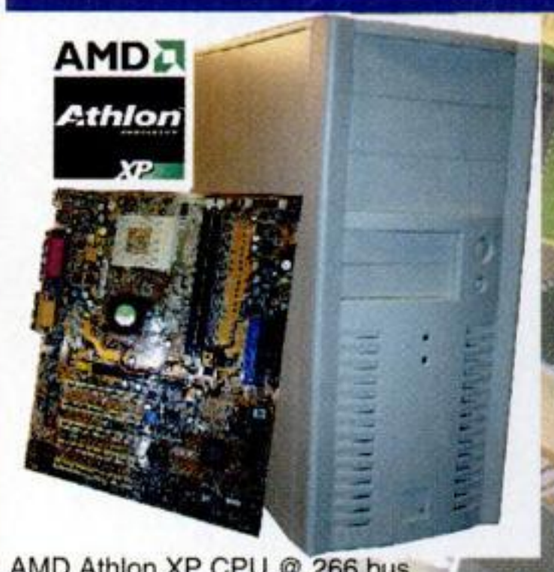

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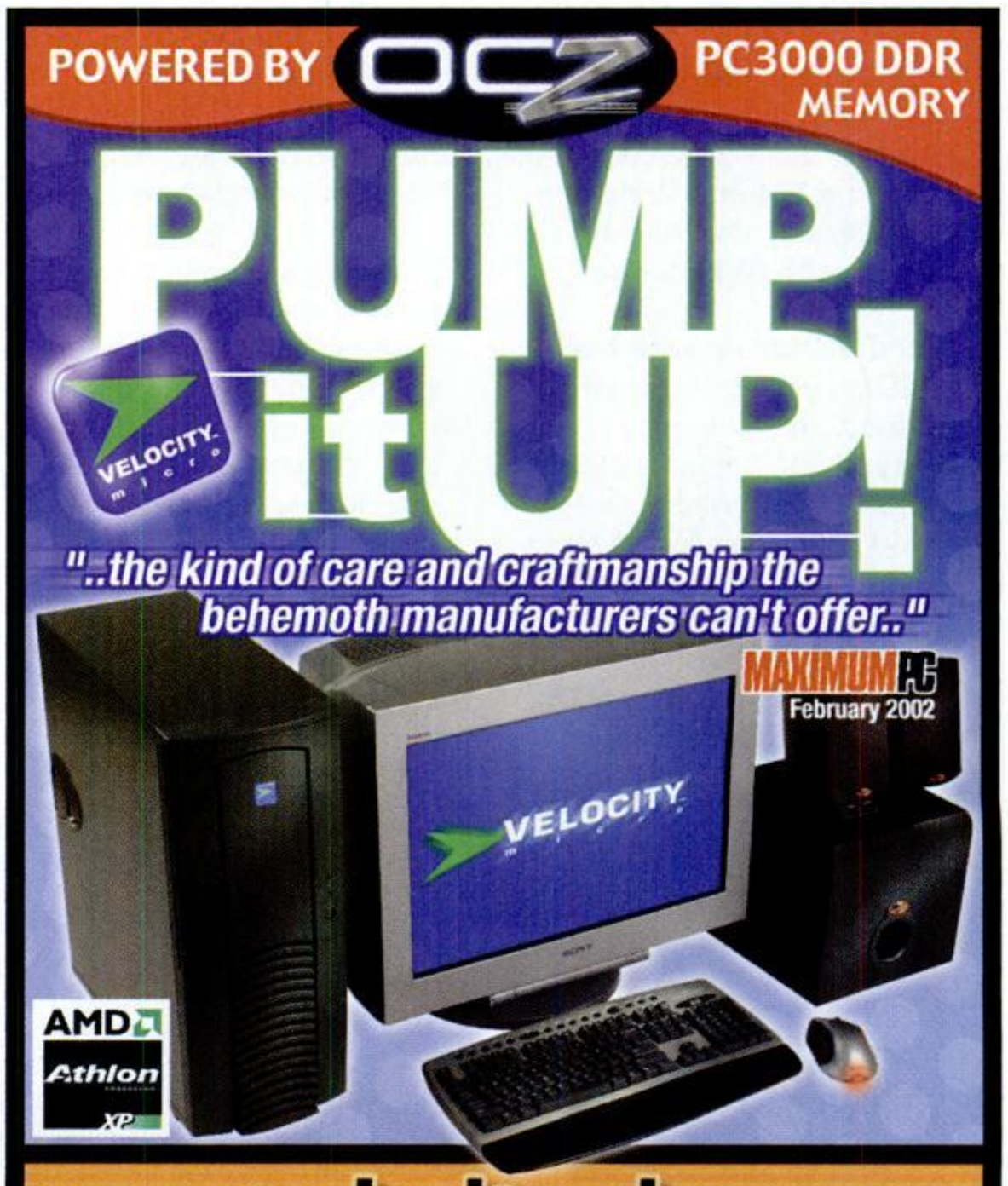

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MAXIMUMPC Rig of the Month

THIS MONTH: CJ Hanson's Caffeine Machine

After all the visual fanfare of last month's rigs, we wanted to take a break from pretty-boy machines and showcase good-old utilitarian PC design. So when we first saw CJ Hanson's water-cooled Pentium 4 project, we knew we'd found our rig. Cosmetically, the Caffeine Machine isn't much to look at, boasting just a simple window and interior light for pomp and circumstance. But once you peek inside the Lian Li PC60 case—or see Hanson's front-mounted LCD monitor—you know you've got a rig loaded with power and creativity. Key components include an Abit TH7-RAID P4 motherboard, a 1.7GHz P4 overclocked to 2.2GHz, 2GB of PC800 RDRAM, a Leadtek GeForce3 videocard, two Maxtor drives striped in RAID 0, and a 17.4-inch Princeton LCD display that runs off the GeForce3's DVI interface.

MPC: What's up with the LCD on your front panel?
I use it mostly to play PlayStation 2 games during breaks from graphic design work, or to display *Winamp* MP3 information. I've also used it for motherboard monitoring, Dreamcast games, and *AOL Instant Messenger.* The LCD doesn't have a brand name on it, but I can tell you it's a 5-inch, ultra-thin, color LCD that I bought on eBay's On the Go Audio store **(www.ebaystores.com/onthegoaudio)**. The dimensions of the screen exactly matched the drive cutout in my case. I had to do only minor cutting inside the case to get it to fit.

MPC: And the watercooler?
For starters, the system doesn't boot at 2.2GHz without watercooling. But the CPU temperature at the 1.7GHz default, with just a heatsink and fan, stabilizes at 105°F, while with watercooling under the same conditions, it runs at 2.2GHz and within 1°F of room temperature. I waterproofed the motherboard and CPU with silicone, mainly to protect against condensation. I used clamps on all hoses, and tested the system for three days before putting the electronics into the case. The real danger isn't with leaking, but with condensation.

MPC: What do you think of cosmetic case mods—all show, no go?
I firmly believe that function and design go hand in hand. There must be a rationale behind anything you decide to do. I considered doing a themed case—like Dr Pepper, because I love Dr Pepper—but I opted for a more universal design that would be more appropriate to my ultimate computer dream.

MPC: So what's next?
I'm going to add another PCI GeForce2 and a second 17.4-inch desktop LCD for *triple*-monitor action.

If you have a contender for Rig of the Month, e-mail **input@maximumpc.com** with pics and a brief write-up.

MPC: What's driving the LCD?
The LCD uses a standard RCA connector, and can be plugged into the ubiquitous TV-out options on videocards. Because I'm not using the LCD as my primary display device, I had to install a PCI Geforce2 card in addition to my AGP GeForce3 card—the latest Windows OSes and nVidia's drivers have built-in support for multiple displays from separate graphic cards. The LCD display is actually an extension of my main desktop display. I can just drag windows from one monitor to the other.

MPC: Doesn't the LCD steal your floppy drive bay?
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What about the other LCDs?
I use the two small LCDs to monitor CPU temperature and ambient temperature. It's a lot easier to glance at them than to look at a little MBM icon in the Systray.

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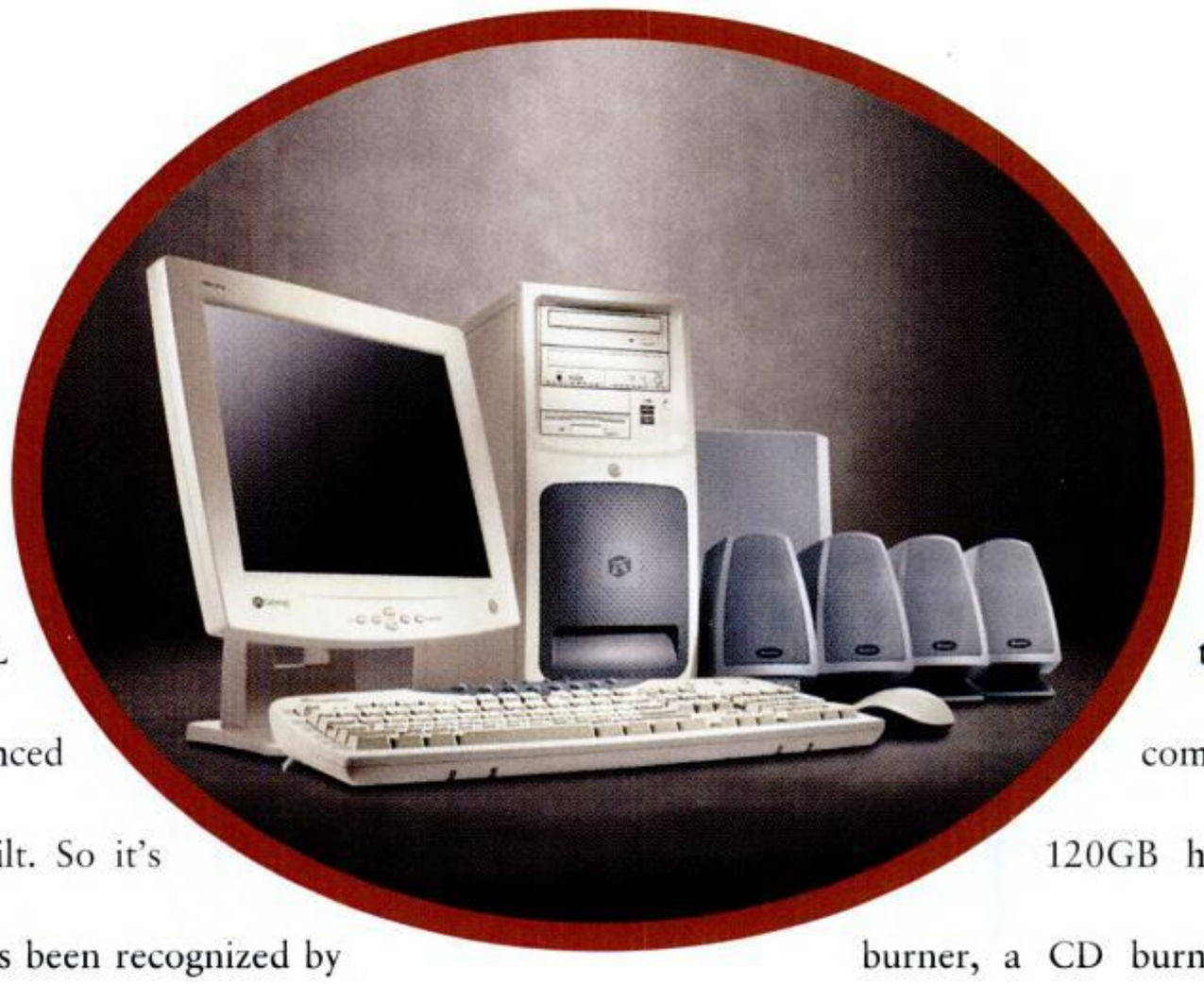

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[1]Pocket Streets for Microsoft® Windows® CE requires Windows® CE 2.0 or later. Hardware available separately. [2]TO AVOID BEING CHARGED A MONTHLY FEE, CANCEL BEFORE ONE-YEAR PERIOD ENDS. One-year period begins 30 days from receipt of system. You may incur surcharges even during promotional period for premium services, or long distance charges on your phone bill, depending on location and calling plan. Communication surcharges may also apply with some access numbers and in AK. **For details and access numbers call 1-800-846-2000.** Check with your local phone company to determine whether the access number you select is a local call for your calling plan. New U.S. members 18 and older only. Major credit card or checking account required. Use may be limited, especially during peak usage. [3]Prices and configurations subject to change without notice or obligation. Prices exclude shipping and handling and taxes. Not responsible for typographical errors. [4]Monthly payment estimated, based on standard system price (excluding shipping/handling/taxes), 48 month term, and 14.9% APR. The

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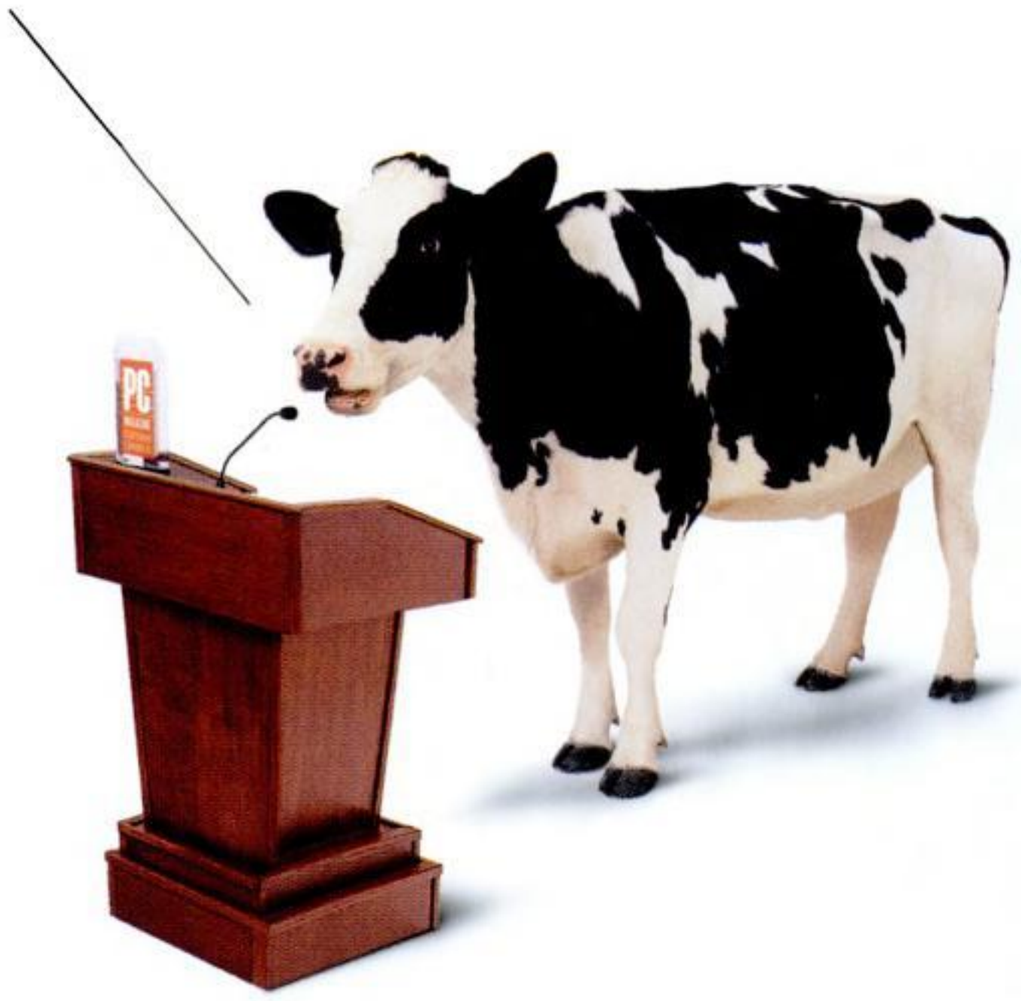
Wow, Editors' Choice. I can't believe it. I'd like to thank PC Magazine for giving the Gateway 700XL their highest award – this means a lot to me. Of course I've got to thank the Big Bovine upstairs, and give a big Dakota style shout out to my main man Teddy and the rest of the crew over at Gateway – you guys know who you are – you're solid. Mom & Dad – I love you. Gotta give props to all my brothers in the Herd and the rest of my posse down in the pasture – we'll be kickin' it later on down at Bade's Feed & Grain! Oh, and I want to give a big hug to my astrologer, Angus – you're charts have never let me down. Much love to my life coach, Guernsey, and to my therapist Dr. Holstein, there's been a lot of ups and downs on the journey up to this moment, and you guys have always stood by me. And, if you'll just bear with me for a moment, I've got a little list here of people I'd be in big trouble if I forgot to thank. My agent, Jersey, who's worked so tirelessly for all these many years to help me get to this place. My trainer, Hereford. My Feng Shui coach, Brahma. Thanks to Rob – Rob you've always got my back. My manager, Pam My stylist, Joe, who never lets me leave the barn without looking my best. Adam, Todd, Ashley, and everyone else who helps keep my stuff in order, My photographer Kurt. My retoucher, Cary. Nancy, Rex, Isabelle, Teresa, Terry, Liz, and all those other folks who help when I've got public appearances, Nelson, Berns and the rest of the cattle in my band. My DJ, Mixmaster Mike. My sommelier, P. Edward Rosenthal. My speech writer, the Legendary S-MAN. To all of you, thanks for everything. Oh, and a big, big thank you to all the shorthorns and longhorns, steers and heifers out there who've shown so much support over the years. And finally, to all those folks around the farm who ever doubted me, check it out. Editor's Choice! Put that in your cud and chew it!"



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